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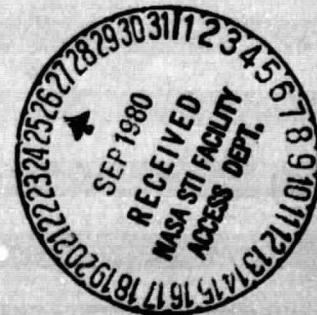
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# Report on Active and Planned Spacecraft and Experiments

August 1980



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Code 601.4  
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World Data Center A for Rockets and Satellites  
Code 601  
Goddard Space Flight Center  
Greenbelt, Maryland 20771  
U.S.A.

Telephone: (301) 344-6695  
Telex No.: 89675  
TWX No.: 7108289716

REPORT ON ACTIVE AND PLANNED  
SPACECRAFT AND EXPERIMENTS

Edited by

Richard Morowitz

Robert W. Vostreys

National Space Science Data Center

August 1980

National Space Science Data Center (NSSDC)/  
World Data Center A for Rockets and Satellites (WDC-A-R&S)  
National Aeronautics and Space Administration  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

PREFACE

The Report on Active and Planned Spacecraft and Experiments provides the professional community with information on current as well as planned spacecraft activity in a broad range of scientific disciplines. Spacecraft that were active sometime in the period June 1, 1979, to May 31, 1980, are included, as well as those planned missions that have progressed beyond the experiment or investigation selection stage. This document provides a brief description for each spacecraft and experiment as well as its current status. The performance information for active NASA and NASA-cooperative programs is based, to a large extent, on the project office status reports through May 31, 1980. The National Space Science Data Center (NSSDC) has attempted to update all performance information to that date.

We would like to acknowledge the cooperation of the staff at NSSDC in obtaining information and offering suggestions for this report. The cooperation of the project offices and experimenters in supplying current documentation of their spacecraft and experiments is gratefully acknowledged. We are particularly pleased with the many constructive comments and corrections we have received from interested users of this report.

Richard Horowitz  
Robert W. Vostreys

August 1980

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\*For a complete listing of the spacecraft and experiments described in these sections, please refer to the Index of Active and Planned Spacecraft and Experiments (Section 4).

1

## INTRODUCTION

## 1. INTRODUCTION

### 1.1 Purpose

This report provides the professional community with information on current and planned spacecraft activity for a broad range of scientific disciplines. By providing a brief description of each spacecraft and experiment as well as its current status, it is hoped that this document will be useful to many people interested in the scientific, applied, and operational uses of data collected. Furthermore, for those planning or coordinating future observational programs employing a number of different techniques such as rockets, balloons, aircraft, ships, and buoys, this document can provide some insight into the contributions that may be provided by orbiting instruments.

### 1.2 Contents

This document includes information concerning active and planned spacecraft and experiments known to the National Space Science Data Center (NSSDC). The information covers a wide range of disciplines: astronomy, earth sciences, meteorology, planetary sciences, aeronomy, particles and fields, solar physics, life sciences, and material sciences. These spacecraft projects represent the efforts and funding of individual countries as well as cooperative arrangements among different countries.

Descriptions of navigational and communications satellites are specifically not included here. Also not given are descriptions of spacecraft that contain only continuous radio beacons used for ionospheric studies. Many of these spacecraft are listed in the *SPACEWARN Bulletin\**. No attempt has been made to present information regarding classified spacecraft or experiments.

### 1.3 Organization

This report is divided into two major parts with descriptive material introducing each section.

The first half of this report, Section 2 - "Descriptions of Active Spacecraft and Experiments," is a listing of descriptions of the spacecraft and experiments that were active sometime during the period June 1, 1979, to

\*The *SPACEWARN Bulletin* is prepared by the World Data Center A for Rockets and Satellites, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771, USA. It is intended to serve as an international communications mechanism for the rapid distribution of information on satellites and space probes. It is published on behalf of the Committee on Space Research (COSPAR) by the International URSIGRAM and World Days Service (IUDS), a permanent service of the International Scientific Radio Union in association with the International Astronomical Union and the International Union for Geodesy and Geophysics.

May 31, 1980. The listing is arranged by spacecraft common name and the last name of the principal investigator or team leader.

The second part, Section 3 - "Descriptions of Planned Spacecraft and Experiments," contains descriptions of the spacecraft and experiments that were planned or approved missions as of May 31, 1980, for which experiments or investigations have been selected and NSSDC has at least minimal documentation.

Sections 4 and 5 are indexes to the information presented in Sections 2 and 3. Section 4, "Index of Active and Planned Spacecraft and Experiments," is an alphabetical listing by spacecraft name, including both common and alternate names, of all active and planned spacecraft and experiments. This listing serves as an index to the location of spacecraft and experiment descriptions and includes launch dates and current status-of-operation data. Section 5, "Investigator Name Index," is a listing, ordered by last name, of the investigators or team members associated with the experiments and their current affiliations.

These major sections were generated from NSSDC automated files. Other relevant spacecraft without brief descriptions are given in Appendix A. Special investigators for some missions that could not be presented conveniently in Section 2 or 3 appear in Appendix B. Certain words and phrases used in this report are defined in Appendix C. Appendix D is a comprehensive list of the abbreviations and acronyms used in this document.

#### 1.4 Document Availability

Upon request, NSSDC will provide copies of this report and future supplements to individuals or organizations resident in the United States who can establish a need (in writing or by telephone) for this information. The same services are available to persons outside the United States through the World Data Center A for Rockets and Satellites (WDC-A-R&S). The official addresses for requests are printed on the inside front cover.

Recipients are requested to inform potential users of the availability of this report. Because of continuing costs involved in publishing a document of this size on a periodic basis, NSSDC encourages individuals located at the same organization to share this document.

#### 1.5 Request for Additions/Corrections

NSSDC continually strives to increase the usefulness of this report by improving the spacecraft and experiment descriptions and by including additional spacecraft and experiments as they become known to NSSDC. This report is complete and reasonably accurate concerning NASA and NASA-cooperative programs; however, descriptions of other spacecraft and experiments may be incomplete because of a lack of information available to NSDDC. It should be noted that the information concerning the planned spacecraft and experiments is frequently general in nature and subject to change.

NSSDC would welcome comments as to errors or omissions in this report. Recommendations regarding the overall contents and organization also would be appreciated. In particular, it is hoped that principal experimenters and project offices will cooperate in bringing such matters to NSSDC's attention.

**2**

**DESCRIPTIONS OF ACTIVE SPACECRAFT  
AND EXPERIMENTS**

## 2. DESCRIPTIONS OF ACTIVE SPACECRAFT AND EXPERIMENTS

This section contains descriptions of spacecraft and experiments pertinent to this report that were active sometime during the period June 1, 1979, to May 31, 1980. A few changes subsequent to this date may appear, depending on availability. The descriptions are sorted first by spacecraft common name. Within each spacecraft listing, experiments are ordered by the principal investigator's or team leader's last name. Explorer spacecraft prelaunch generic names are used as common names; e.g., IMP-J instead of Explorer 50. If the common name, as used by NSSDC, is not known, it can be found by referring to an alternate name in the Index of Active and Planned Spacecraft and Experiments (Section 4).

Each spacecraft or experiment entry in this section is composed of two parts, a heading and brief description. The headings list characteristics of satellites and experiments. Many of the terms used in this section are defined in Appendix C.

### 2.1 Contents of Spacecraft Entries

The heading for each spacecraft description in this section includes a set of initial orbit parameters: orbit type, epoch date, orbit period, apoapsis, periapsis, and inclination for the spacecraft. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft weight, launch date, site, and vehicle, spacecraft common and alternate names, NSSDC ID code, sponsoring country and agency, and spacecraft personnel:

CODE CO (general contact)  
CODE MG (program manager)  
CODE MM (mission manager)  
CODE MS (mission scientist)  
CODE PC (project coordinator)  
CODE PD (project director)  
CODE PE (project engineer)  
CODE PM (project manager)  
CODE PS (project scientist)  
CODE SC (program scientist)  
CODE TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for the missions of other countries or agencies have been given the same position names. The spacecraft brief description is immediately below each heading.

### 2.2 Contents of Experiment Entries

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the name and affiliation or location of the principal investigator (PI) or team leader

"PRECEDING PAGE BLANK NOT FILMED" 9

"PRECEDING PAGE BLANK NOT FILMED"

(TL) for the experiment as well as other investigators (OI), team members (TM), deputy team leader (DT), co-investigator (CI), or general contact (CO) associated with the experiment. The investigators are not listed in any particular order within each experiment. The experiment brief description is immediately below each heading.

The investigative program may include one of the following NASA Headquarters division codes:

CODE EB (Environmental Observations)  
CODE EC (Communications)  
CODE EM (Space Processing)  
CODE ER (Resource Observations)  
CODE RS (Space Systems)  
CODE SB (Life Sciences)  
CODE SC (Astrophysics)  
CODE SL (Planetary)  
CODE ST (Solar Terrestrial)

The addition of /CO-OP to any code indicates a cooperative effort between NASA and another agency.

### 2.3 Active Spacecraft and Experiment Descriptions

A spacecraft is included in the active section of this report if it had a status of "normal" or "partial" and a data acquisition rate of "standard" or "substandard" for any length of time since June 1, 1979. Experiments that meet these same criteria also are included.

Active spacecraft with only passive experiments such as laser reflectors or those only used in upper atmospheric drag observations are included in Appendix A.

\*\*\*\*\* 1976-059A \*\*\*\*\*

SPACECRAFT COMMON NAME- 1976-059A

ALTERNATE NAMES- 08916; USAF OPERATIONAL SAT-76

NSSDC ID- 76-059A

LAUNCH DATE- 06/26/76 WEIGHT- KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1436. MIN  
PERIAPSIS- 36000. KM ALT

EPOCH DATE- 06/20/76  
INCLINATION- 0. DEG  
APOAPSIS- 36000. KM ALT

PERSONNEL

PM - SAMSO USAF-LAS  
PS - W.D. EVANS LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE SATELLITE WAS PLACED IN A GEOSTATIONARY ORBIT WITH SOME STATION CHANGING CAPABILITIES. IT WAS SPIN STABILIZED AT 6 RPM WITH ITS SPIN VECTOR ALIGNED ALONG A RADIUS VECTOR TO THE EARTH BY AN ACTIVE CONTROL SYSTEM. REAL-TIME PARTICLE DATA WERE USED BY SELECTED US AGENCIES FOR SPACE DISTURBANCE MONITORING AND FORECASTING.

\*\*\*\*\* 1976-059A, HIGBIE \*\*\*\*\*

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 76-059A-01 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R. HIGBIE LOS ALAMOS SCI LAB  
OI - R.D. BELIAN LOS ALAMOS SCI LAB  
OI - D.M. BAKER LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE ENERGETIC PARTICLE DETECTOR CONSISTED OF FOUR SOLID-STATE DETECTOR UNITS TO MEASURE ELECTRON, PROTON, AND ALPHA PARTICLE POPULATIONS. THE LOW-ENERGY ELECTRON (LEE) UNIT WAS MADE WITH FIVE SEPARATE ELEMENTS, EACH WITH A 5-DEG-HALF-ANGLE COLLIMATOR (HAC); THESE DETECTORS VIEWED AT 0 DEG, PLUS AND MINUS 30 DEG, AND PLUS AND MINUS 60 DEG LATITUDE RELATIVE TO THE SPACECRAFT EQUATORIAL PLANE. THE LEE MEASURED ELECTRONS ABOVE SEVEN THRESHOLD ENERGIES RANGING FROM 30 TO 300 KEV. THE HIGH-ENERGY ELECTRON UNIT CONSISTED OF ONE DETECTOR WITH AN 8-DEG HAC; FLUXES ABOVE SEVEN THRESHOLD ENERGIES RANGING FROM 0.2 TO 2.0 MEV WERE MEASURED. THE LOW-ENERGY PROTON UNIT CONSISTED OF A SINGLE DETECTOR WITH A GUARD SCINTILLATOR, A 5-DEG HAC, AND DISCRIMINATORS FOR 11 THRESHOLD ENERGIES RANGING FROM 50 TO 500 KEV. THE HIGH-ENERGY PROTON (HEP) UNIT WAS A THREE-ELEMENT TELESCOPE WITH A GUARD SCINTILLATOR AND A 15-DEG HAC THAT MEASURED PROTONS WITHIN 16 ENERGY INTERVALS RANGING FROM 0.5 TO 150 MEV. ON COMMAND, THE HEP COULD MEASURE ALPHA PARTICLES IN 16 ENERGY INTERVALS RANGING FROM 1.2 TO 600 MEV.

\*\*\*\*\* 1977-007A \*\*\*\*\*

SPACECRAFT COMMON NAME- 1977-007A

ALTERNATE NAMES- 09803; USAF OPERATIONAL SAT-77

NSSDC ID- 77-007A

LAUNCH DATE- 02/06/77 WEIGHT- KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1436. MIN  
PERIAPSIS- 36000. KM ALT

EPOCH DATE- 02/02/77  
INCLINATION- 0. DEG  
APOAPSIS- 36000. KM ALT

PERSONNEL

PM - SAMSO USAF-LAS  
PS - W.D. EVANS LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE SATELLITE WAS PLACED IN A GEOSTATIONARY ORBIT WITH SOME STATION CHANGING CAPABILITIES. IT WAS SPIN STABILIZED AT 6 RPM WITH ITS SPIN VECTOR ALIGNED ALONG A RADIUS VECTOR TO THE EARTH BY AN ACTIVE CONTROL SYSTEM. REAL-TIME PARTICLE DATA WERE USED BY SELECTED US AGENCIES FOR SPACE DISTURBANCE MONITORING AND FORECASTING.

\*\*\*\*\* 1977-007A, HIGBIE \*\*\*\*\*

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 77-007A-01 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R. HIGBIE LOS ALAMOS SCI LAB  
OI - R.D. BELIAN LOS ALAMOS SCI LAB  
OI - D.M. BAKER LOS ALAMOS SCI LAB

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\*\*\*\*\* 1979-053A \*\*\*\*\*

SPACECRAFT COMMON NAME- 1979-053A

ALTERNATE NAMES- 11397; USAF OPERATIONAL SAT-79

NSSDC ID- 79-053A

LAUNCH DATE- 06/10/79 WEIGHT- KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1436.5 MIN EPOCH DATE- 06/17/79  
INCLINATION- 0.0 DEG  
PERIAPSIS- 35729. KM ALT APOAPSIS- 35829. KM ALT

PERSONNEL

PM - SAMSO USAF-LAS  
PS - W.D. EVANS LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE SATELLITE WAS PLACED IN A GEOSTATIONARY ORBIT WITH SOME STATION CHANGING CAPABILITIES. IT WAS SPIN STABILIZED AT 6 RPM WITH ITS SPIN VECTOR ALIGNED ALONG A RADIUS VECTOR TO THE EARTH BY AN ACTIVE CONTROL SYSTEM. REAL-TIME PARTICLE DATA WERE USED BY SELECTED US AGENCIES FOR SPACE DISTURBANCE MONITORING AND FORECASTING.

\*\*\*\*\* 1979-057A, HIGBIE \*\*\*\*\*

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 79-057A-01 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R. HIGBIE LOS ALAMOS SCI LAB  
OI - R.D. BELIAN LOS ALAMOS SCI LAB  
OI - D.M. BAKER LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

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ORIGINAL PAGE IS  
OF POOR QUALITY

RANGING FROM 1.2 TO 600 MEV. THIS LATEST INSTRUMENT DIFFERS FROM THE PREVIOUS INSTRUMENTS IN THAT IT HAS A FAST-TIME MODE FOR ELECTRONS.

----- AE-E, BRINTON -----

INVESTIGATION NAME- BENNETT ION-MASS SPECTROMETER (BIMS)

NSSDC ID- 75-107A-10

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

SPACECRAFT COMMON NAME- AE-E  
ALTERNATE NAMES- S 6E, ATMOSPHERE EXPLORER-E  
EXPLORER 59, AE 5

NSSDC ID- 75-107A

LAUNCH DATE- 11/20/75 WEIGHT- 735. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/25/75  
ORBIT PERIOD- 117.29 MIN INCLINATION- 19.7 DEG  
PERIAPSIS- 156. KM ALT APOAPSIS- 2983. KM ALT

PERSONNEL  
RG - M.B. WEINREB NASA HEADQUARTERS  
SC - E.R. SCHMERLING NASA HEADQUARTERS  
PM - J.P. CORRIGAN NASA-GSFC  
PS - N.W. SPENCER NASA-GSFC

BRIEF DESCRIPTION

THE PURPOSE OF THE AE-E MISSION WAS TO INVESTIGATE THE CHEMICAL PROCESSES AND ENERGY TRANSFER MECHANISMS THAT CONTROL THE STRUCTURE AND BEHAVIOR OF THE EARTH'S ATMOSPHERE AND IONOSPHERE IN THE REGION OF HIGH ABSORPTION OF SOLAR ENERGY AT LOW AND EQUATORIAL LATITUDES. THE SIMULTANEOUS SAMPLING AT HIGHER LATITUDES WAS CARRIED OUT BY THE AE-B SPACECRAFT UNTIL ITS FAILURE ON 1/29/76 AND THEN BY AE-C UNTIL IT REENTERED ON 12/12/78. THE SAME TYPE OF SPACECRAFT AS AE-C WAS USED, AND THE PAYLOAD CONSISTED OF THE SAME TYPES OF INSTRUMENTS EXCEPT THAT THE LOW-ENERGY ELECTRON AND UV NITRIC OXIDE EXPERIMENTS WERE DELETED AND A BACKSCATTER UV SPECTROMETER WAS ADDED TO MONITOR THE OZONE CONTENT OF THE ATMOSPHERE. THE TWO EXPERIMENTS THAT WERE DELETED WERE MORE APPROPRIATE FOR THE HIGH LATITUDE REGIONS. THE PERIGEE SWEEP THROUGH MORE THAN SIX FULL LATITUDE CYCLES AND TWO LOCAL TIME CYCLES DURING THE FIRST YEAR AFTER LAUNCH WHEN THE ORBIT WAS ELLIPTICAL AND THE PERIGEE HEIGHT WAS VARIED BETWEEN 130 AND 400 KM. THE CIRCULARIZATION OF THE ORBIT AROUND 390 KM WAS MADE ON 11/20/76 AND THE SPACECRAFT WAS RAISED TO THIS HEIGHT WHENEVER IT WOULD DECAY TO ABOUT 250 KM. MORE DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 263-266, APRIL 1973.

----- AE-E, BRACE -----

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBE (CEP)

NSSDC ID- 75-107A-01 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
IONOSPHERES

PERSONNEL  
PI - L.H. BRACE NASA-GSFC  
OI - R.F. THEIS NASA-GSFC  
OI - A. DALGARNO SAO

BRIEF DESCRIPTION

THE CEP CONSISTED OF TWO IDENTICAL INSTRUMENTS DESIGNED TO MEASURE ELECTRON TEMPERATURES, ELECTRON AND ION CONCENTRATIONS, ION MASS, AND SPACECRAFT POTENTIAL. ONE PROBE WAS ORIENTED ALONG THE SPIN AXIS OF THE SPACECRAFT (USUALLY PERPENDICULAR TO THE ORBIT PLANE), AND THE OTHER RADIAL SO THAT IT COULD OBSERVE IN THE DIRECTION OF THE VELOCITY VECTOR ONCE EACH 15-S. SPIN PERIOD. EACH INSTRUMENT HAS A RETARDING POTENTIAL LANGMUIR PROBE DEVICE THAT PRODUCED A CURRENT-VOLTAGE (I-V) CURVE FOR A KNOWN VOLTAGE PATTERN PLACED ON THE COLLECTOR. ELECTROMETERS WERE USED TO MEASURE THE CURRENT. THERE WERE TWO SYSTEMS OF OPERATION (ONE WITH TWO MODES AND ANOTHER WITH THREE MODES) USING COLLECTOR VOLTAGE PATTERNS BETWEEN PLUS AND MINUS 5 VOLTS. MOST MODES INVOLVED AN AUTOMATIC OR FIXED ADJUSTMENT OF COLLECTOR VOLTAGE LIMITS (AND/OR ELECTROMETER OUTPUT) SUCH THAT THE REGION OF INTEREST ON THE I-V PROFILE PROVIDED HIGH RESOLUTION. EACH SYSTEM WAS DESIGNED FOR USE WITH ONLY ONE OF THE PROBES, BUT THEY COULD BE INTERSWITCHED TO PROVIDE BACKUP REDUNDANCY. THE BEST MEASUREMENTS IN THE MOST FAVORABLE MODES PROVIDED 1-5 TIME RESOLUTION; ELECTRON TEMPERATURE BETWEEN 300 AND 1.0E4 DEG K (10 PERCENT ACCURACY); ION DENSITY BETWEEN 1.0E4 AND 1.0E5 PER CUBIC CM (10-20 PERCENT ACCURACY); ELECTRON DENSITY BETWEEN 50 AND 1.0E4 PER CUBIC CM; AND ION MASS AT ION DENSITIES ABOVE 1.0E4 PER CUBIC CM. EACH PROBE HAS A COLLECTOR ELECTRODE EXTENDING FROM THE CENTRAL AXIS OF A CYLINDRICAL GUARD RING. THE 2.5-CM-LONG GUARD RING WAS AT THE END OF A 25-CM BOOM, AND THE COLLECTOR EXTENDED ANOTHER 7.5 CM BEYOND THE GUARD RING. THE BOOM, GUARD, AND COLLECTOR WERE 0.2 CM IN DIAM. MORE DETAILED INFORMATION CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 341-348, APRIL 1973.

PERSONNEL

PI - H.C. BRINTON  
OI - R.W. PHARD, III  
OI - M.A. TAYLOR, JR.

NASA-GSFC  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT WAS FLOWN TO MEASURE, THROUGHOUT THE ORBIT, THE INDIVIDUAL CONCENTRATIONS OF ALL THERMAL ION SPECIES IN THE MASS RANGE 1 TO 72 ATOMIC MASS UNITS (U) AND IN THE AMBIENT DENSITY RANGE FROM 5 IONS PER CUBIC CM TO 5.0E6 IONS PER CUBIC CM EACH. THE MASS RANGE IS NORMALLY SCANNED IN 1.6 S, BUT THE SCAN TIME PER RANGE CAN BE INCREASED BY COMMAND. LABORATORY AND IN-FLIGHT DETERMINATION OF SPECTROMETER EFFICIENCY AND MASS DISCRIMINATION PERMITTED DIRECT CONVERSION OF MEASURED ION CURRENTS TO AMBIENT CONCENTRATIONS. CORRELATION OF THESE MEASURED DATA WITH THE RESULTS FROM COMPANION EXPERIMENTS, 'ELECTROSTATIC PROBE (75-107A-01)' AND 'RETARDING POTENTIAL ANALYZER (75-107A-04)', PERMITTED INDIVIDUAL ION CONCENTRATIONS TO BE DETERMINED WITH HIGH ACCURACY. THE EXPERIMENT'S FOUR PRIMARY MECHANICAL COMPONENTS WERE: GUARD RING AND ION-ANALYZER TUBE, COLLECTOR AND PREAMPLIFIER ASSEMBLY, VENT, AND MAIN ELECTRONICS HOUSING. A THREE-STAGE BENNETT TUBE WITH 7- TO 5-CYCLE DRIFT SPACES WAS FLOWN, AND HAS BEEN MODIFIED TO PERMIT ION CONCENTRATION MEASUREMENTS TO BE OBTAINED DOWN TO 120 KM ALTITUDE. SPECIFICALLY, A VENT WAS PROVIDED AT THE REAR OF THE SPECTROMETER, AND THE USUAL FLAT-DISK, ION-CURRENT COLLECTOR WAS REPLACED BY A STACK OF WIRE-MESH GRIDS. THE BALANCE BETWEEN ION-CURRENT SENSITIVITY AND MASS-RESOLUTION IN A BENNETT SPECTROMETER MAY BE ALTERED BY CHANGING APPROPRIATE VOLTAGES. THESE VOLTAGE CHANGES WERE CONTROLLED INDEPENDENTLY BY GROUND COMMAND FOR EACH ONE OF THE THREE MASS RANGES -- 1 TO 4, 2 TO 16, AND 8 TO 72. MORE COMPLETE EXPERIMENT DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 323-332, APRIL 1973.

----- AE-E, CHAMPION -----

INVESTIGATION NAME- ATMOSPHERIC DENSITY ACCELEROMETER (MESA)

NSSDC ID- 75-107A-02

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
IONOSPHERES

PERSONNEL

PI - K.S.W. CHAMPION  
OI - F.A. MARCUS

USAF GEOPHYS LAB  
USAF GEOPHYS LAB

BRIEF DESCRIPTION

MESA (MINIATURE ELECTROSTATIC ANALYZER) OBTAINED DATA ON THE NEUTRAL DENSITY OF THE ATMOSPHERE IN THE ALTITUDE RANGE OF 120 KM TO 400 KM BY THE MEASUREMENTS OF SATELLITE DECELERATION DUE TO AERODYNAMIC DRAG. THE INSTRUMENT CONSISTED OF THREE SINGLE-AXIS ACCELEROMETERS, MOUNTED MUTUALLY AT RIGHT ANGLES, TWO IN THE SPACECRAFT X-Y PLANE AND THE OTHER ALONG THE Z-AXIS. THE INSTRUMENT DETERMINED THE APPLIED ACCELERATION FROM THE ELECTROSTATIC FORCE REQUIRED TO RECENTER A PROOF MASS. THE OUTPUT OF THE DEVICE WAS A DIGITAL PULSE RATE PROPORTIONAL TO THE APPLIED ACCELERATION. THE MEASUREMENTS ALLOWED DETERMINATION OF THE DENSITY OF THE NEUTRAL ATMOSPHERE, MONITORED THE THRUST OF THE ORBIT-ADJUST PROPULSION SYSTEM (OAPS), DETERMINED THE SATELLITE MINIMUM ALTITUDE, MEASURED SPACECRAFT ROLL, AND PROVIDED SOME ATTITUDE-SENSING INFORMATION. SPACECRAFT NUTATIONS OF LESS THAN 0.01 DEGREES WERE MONITORED. THE INSTRUMENT HAD THREE SENSITIVITY RANGES -- 8.E-3 EARTH'S GRAVITY (G) IN OAPS MONITOR MODE; 4.E-4 G BETWEEN 120 KM (PLUS OR MINUS 2 PERCENT) AND 280 KM (PLUS OR MINUS 10 PERCENT); AND 2.E-5 G BETWEEN 180 KM (PLUS OR MINUS 2 PERCENT) AND 400 KM (PLUS OR MINUS 10 PERCENT). NUMBERS IN PARENTHESES REPRESENT ERRORS; IN ADDITION, THERE MAY BE A SYSTEMATIC ERROR OF UP TO PLUS OR MINUS 5 PERCENT DUE TO DRAG COEFFICIENT UNCERTAINTY. THE HIGHEST ALTITUDE WAS DETERMINED ASSUMING THE INSTRUMENT COULD SENSE TO 0.2 PERCENT OF FULL SCALE. MORE DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 297-303, APRIL 1973.

----- AE-E, DOERING -----

INVESTIGATION NAME- PHOTOELECTRON SPECTROMETER (PES)

NSSDC ID- 75-107A-03

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES

**PERSONNEL**  
PI - J.P. DOERING  
OI - C.O. BOSTROM

JOHNS HOPKINS U  
APPLIED PHYSICS LAB

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO PROVIDE INFORMATION ON THE INTENSITY, ANGULAR DISTRIBUTION, ENERGY SPECTRUM, AND NET FLOW ALONG FIELD LINES, OF ELECTRONS IN THE THERMOSPHERE WITH ENERGIES BETWEEN 2 AND 500 EV. THE INSTRUMENT CONSISTED OF TWO IDENTICAL, OPPositELY DIRECTED, HEMISPHERICAL, ELECTROSTATIC ANALYZERS. EACH SPECTROMETER HAD A RELATIVE ENERGY RESOLUTION OF PLUS OR MINUS 2.5 PERCENT AND A GEOMETRIC FACTOR ON THE ORDER OF 0.001 SQ CM-SR, INDEPENDENT OF ELECTRON ENERGY. THREE SEPARATE ENERGY RANGES COULD BE MEASURED -- 0 TO 25 EV, 0 TO 100 EV, OR 0 TO 500 EV. MEASUREMENTS FROM THESE INTERVALS COULD BE SEQUENCED IN 5 DIFFERENT WAYS. DATA COULD BE TAKEN FROM EITHER SENSOR SEPARATELY, OR ALTERNATELY WITH TIME RESOLUTION VARYING FROM 0.25 TO 8 S. THERE WERE TWO DEFLECTION VOLTAGE SCAN RATES DETERMINED BY SPACECRAFT CLOCK. THIS VOLTAGE WAS CHANGED IN 64 STEPS, AND WAS DONE AT 4 OR 16 STEPS PER TELEMETRY FRAME, WITH 16 FRAMES/S. THIS ALLOWED A CHOICE OF EITHER ONE 64-POINT SPECTRUM, OR FOUR 16-POINT SPECTRA IN ONE SECOND. THE LONGEST (8 S) CYCLE OF DATA INVOLVED OBSERVATIONS USING INCREASING VOLTAGE STEPS FOR THE LOWEST, MIDDLE, LOWEST, THEN HIGHEST ENERGY RANGES (IN THAT ORDER) FOR 1 S EACH. A REPEAT FOR DECREASING VOLTAGE STEP COMPLETED THE CYCLE. A MORE DETAILED DESCRIPTION OF THIS EXPERIMENT MAY BE FOUND IN 'RADIO SCIENCE,' 8, 4, 387-392, APRIL 1973.

----- AE-E, HANSON -----

**INVESTIGATION NAME-** RETARDING POTENTIAL ANALYZER/DRIFT METER (RPA)

NSSDC ID- 75-107A-04

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
IONOSPHERES

**PERSONNEL**

PI - W.B. HANSON U OF TEXAS, DALLAS  
OI - D.R. ZUCCARO U OF TEXAS, DALLAS  
OI - S. SANATANI U OF TEXAS, DALLAS  
OI - C.R. LIPPENCOTT U OF TEXAS, DALLAS

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO DETERMINE OBSERVATIONS OF VECTOR ION DRIFT VELOCITIES, ION CONCENTRATION AND TEMPERATURE, AND SPACECRAFT POTENTIAL. AN IONOSPHERIC IRREGULARITY INDEX WAS ALSO OBTAINED FROM THE ION CONCENTRATION SENSOR. THE EXPERIMENT CONSISTED OF A RETARDING POTENTIAL ANALYZER WITH FOUR PLANAR SENSOR HEADS. THE SENSOR HEAD USED FOR ION DRIFT MEASUREMENTS WAS CO-LOCATED WITH ANOTHER HEAD, AND ALL WERE SPACED NEARLY EQUALLY, LOOKING OUTWARD FROM THE SATELLITE EQUATOR. SINCE THE SATELLITE SPIN AXIS WAS PERPENDICULAR TO THE ORBIT PLANE, THESE HEADS COULD OBSERVE ALONG THE SPACECRAFT VELOCITY VECTOR IN EITHER THE SPIN OR BESPUN MODE OF THE SPACECRAFT. THE PRIMARY PURPOSE OF THIS EXPERIMENT WAS TO PROVIDE ACCURATE ION TEMPERATURES WITH OTHER MEASUREMENTS BEING OF SECONDARY IMPORTANCE. THREE OF THE SENSOR HEADS WERE SIMILAR. THEY HAD TWO GROUNDED ENTRANCE GRIDS, TWO RETARDING GRIDS, A SUPPRESSOR GRID, A SHIELD GRID, AND A COLLECTOR. A LINEAR SWEEP VOLTAGE (32 OR 22 TC V, UP OR DOWN) WAS NORMALLY APPLIED TO THE RETARDING GRIDS IN 0.75 S. INTERPRETATION OF THE RESULTING CURRENT-VOLTAGE PROFILES PROVIDED THE ION TEMPERATURE, THE ION AND ELECTRON CONCENTRATION, SOME ION COMPOSITION INFORMATION, VEHICLE POTENTIAL, AND PLASMA DRIFT VELOCITY PARALLEL TO THE VELOCITY VECTOR. TWO OF THE THREE SIMILAR SENSORS HAD AN ADDITIONAL GRID BETWEEN THE ENTRANCE AND RETARDING GRIDS IN ORDER TO PROTECT INNER GRIDS FROM ION BOMBARDMENT DURING ELECTRON MEASUREMENTS. THE OTHER SIGNIFICANT FEATURE OF THESE TWO SENSORS WAS THAT A SMALL POSITIVE COLLECTOR BIAS COULD BE APPLIED TO ASSURE ADEQUATE ACCESS OF THERMAL ELECTRONS TO THE COLLECTOR. WITH THE RETARDING GRID AT CONSTANT ZERO VOLTS, CURRENT CHANGES COULD BE OBSERVED FOR 3-S PERIODS TO OBTAIN GRADIENTS OF ION CONCENTRATION. ELECTRON PARAMETERS WERE MEASURED IN A MANNER SIMILAR TO IONS EXCEPT FOR THE LINEAR SWEEP VOLTAGE (-3 OR -2 TO 0 V, UP OR DOWN) RANGE. IONS IN MASS RANGES 1 TO 4, 14 TO 16, 24 TO 32 AND GREATER THAN 40 U COULD BE IDENTIFIED. THE FOURTH SENSOR HEAD WAS FOR THE ION-DRIFT VELOCITY MEASUREMENTS, AND CONSISTED OF FOUR GROUNDED GRIDS, A NEGATIVELY BIASED SUPPRESSOR GRID, AND A FOUR-SEGMENT COLLECTOR. DIFFERENCES IN VARIOUS COLLECTOR SEGMENT CURRENTS PROVIDED ION-DRIFT DIRECTIONAL COMPONENT INFORMATION. MORE DETAILS OF THIS EXPERIMENT ARE AVAILABLE IN 'RADIO SCIENCE,' 8, 4, 333-339, APRIL 1973.

----- AE-E, HAYES -----

**INVESTIGATION NAME-** VISIBLE AIRGLOW PHOTOMETER (VAE)

NSSDC ID- 75-107A-11

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - P.B. HAYS U OF MICHIGAN  
OI - G.G. SHEPHERD YORK U  
OI - G.R. CARIGNAN U OF MICHIGAN  
OI - J.C.G. WALKER U OF MICHIGAN

**BRIEF DESCRIPTION**

THIS EXPERIMENT PROVIDED DETAILED DATA ON THE RATES OF EXCITATION OF THE ATOMIC AND MOLECULAR CONSTITUENTS OF THE THERMOSPHERE. THE WAVELENGTH RANGE COVERED, EXPRESSED IN ANGSTROMS, WAS MEASURED IN PAIRS -- 7319 AND 6563, 5330 AND 5577, AND 7319, 2800 AND 5200, 6300 AND 5577, CALIBRATE AND 2800, AND 6563 AND 6300. A PHOTOMETER WAS USED WHICH CONTAINED TWO SEPARATE OPTICAL CHANNELS, A NARROW FIELD OF VIEW AND A WIDE FIELD OF VIEW. SPECTRAL SELECTION WAS ACCOMPLISHED WITH A FILTER WHEEL THAT CONTAINED SIX INTERFERENCE FILTERS AND A DARK AND CALIBRATE POSITION. THE TWO CHANNELS WERE SEPARATED BY 90 DEG. ONE CHANNEL HAD A 3-DEG HALF-ANGLE CONE FIELD OF VIEW FOR HIGH SENSITIVITY AND POINTED NORMALLY TOWARD THE LOCAL ZENITH. THE SECOND HAD A FIELD OF VIEW OF 0.75-DEG HALF CONE FOR HIGH SPATIAL RESOLUTION POINTING TANGENT TO THE SURFACE OF THE EARTH WHEN THE SATELLITE WAS IN THE ORIENTED MODE. BOTH CHANNELS WERE PROTECTED FROM STRAY LIGHT CONTAMINATION DURING THE DAYTIME WITH MULTISTAGE BAFFLE SYSTEMS. FILTERS WERE OPERATED IN SEVERAL MODES. THE TWO SEPARATE OPTICAL CHANNELS WERE MONITORED AT TIME INTERVALS CONSISTENT WITH THEIR ANGULAR RESOLUTION IN THE SPINNING MODE. MORE EXPERIMENT DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 369-377, APRIL 1973.

----- AE-E, HEATH -----

**INVESTIGATION NAME-** BACKSCATTER UV SPECTROMETER (BUV)

NSSDC ID- 75-107A-16

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES

**PERSONNEL**  
PI - D.F. HEATH NASA-GSFC

**BRIEF DESCRIPTION**  
THE BACKSCATTER ULTRAVIOLET INSTRUMENT (BUV) MONITORED THE SPATIAL DISTRIBUTION OF ATMOSPHERIC OZONE BY MEASURING THE INTENSITY OF THE UV RADIATION BACKSCATTERED FROM THE EARTH'S ATMOSPHERE. TO OBTAIN THIS OZONE DISTRIBUTION, THE BUV SUBSYSTEM MEASURED DIRECT SOLAR RADIATION AND BACKSCATTERED UV RADIATION FROM THE DAYTIME SUN-ILLUMINATED ATMOSPHERE. THE EXPERIMENT CONSISTED OF A SPECTROMETER (MONOCHROMATOR) AND A PHOTOMETER. THE MONOCHROMATOR MEASURED THE INTENSITY OF UV RADIATION BACKSCATTER AND REFLECTED RADIATION FROM THE EARTH'S ATMOSPHERE IN 12 WAVELENGTHS (2555 A TO 3390 A) IN WHICH OZONE ATTENUATION OCCURS. THE PHOTOMETER MEASURED THE REFLECTED UV RADIATION IN A SINGLE WAVELENGTH SPAN IN WHICH ATTENUATION BY OZONE DOES NOT OCCUR. THE BUV HAD FOUR OPERATING MODES.

----- AE-E, HEDIN -----

**INVESTIGATION NAME-** NEUTRAL ATMOSPHERE COMPOSITION (NACE)

NSSDC ID- 75-107A-08

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
IONOSPHERES  
ATMOSPHERIC PHYSICS

**PERSONNEL**  
PI - A.E. HEDIN NASA-GSFC  
OI - C.A. REBER NASA-GSFC  
OI - G.R. CARIGNAN U OF MICHIGAN

**BRIEF DESCRIPTION**

THIS EXPERIMENT MEASURED IN SITU THE SPATIAL DISTRIBUTION AND TEMPORAL CHANGES OF THE CONCENTRATIONS OF THE NEUTRAL ATMOSPHERIC SPECIES. IN ADDITION, NEW INSIGHT INTO IN SITU MEASUREMENT TECHNIQUES WAS OBTAINED FROM COMPARISONS OF THESE MEASUREMENTS WITH THOSE OBTAINED FROM OTHER ONBOARD EXPERIMENTS, NAMELY, OPEN SOURCE SPECTROMETER (75-107A-07), SOLAR 1-EV SPECTROPHOTOMETER (75-107A-06), AND DENSITY-ACCELEROMETER (75-107A-02). THE MASS-SPECTROMETER SENSOR INCLUDED A GOLD-PLATED STAINLESS STEEL THERMALIZING CHAMBER AND ION SOURCE, A HYPERBOLIC ROD QUADRUPOLE ANALYZER, AND AN OFF-AXIS ELECTRON MULTIPLIER. WHEN OPERATING IN THE 'NORMAL' FORMAT, THE ANALYZER MEASURED ALL MASSES IN THE RANGE 1 TO 44, WITH EMPHASIS ON HYDROGEN, HELIUM, OXYGEN, NITROGEN, AND ARGON. ANOTHER FORMAT WAS OPTIMIZED FOR MINOR CONSTITUENT STUDIES OF GAS SPECIES IN THE MEASURED RANGE. SPATIAL RESOLUTION WAS DETERMINED PRIMARILY BY THE MODE OF SPACECRAFT OPERATION. IN ORBIT, THE PRESEALED SPECTROMETER WAS OPENED, AND THE ATMOSPHERIC CONSTITUENTS PASSED THROUGH A KNIFE-EDGED ORIFICE INTO THE THERMALIZATION CHAMBER AND ION SOURCE. SELECTED IONS LEFT THE QUADRUPOLE ANALYZER THROUGH A WEAK FOCUSING LENS AND WERE ACCELERATED INTO AN ELECTRON MULTIPLIER, WHERE THEY WERE TURNED 90 DEG TO STRIKE THE FIRST DYNODE. THE SPECTROMETER HAD A RESOLUTION OF BETTER THAN 1 U FOR ALL MASSES BETWEEN 1 AND 44, AND THE MEASUREMENT SYSTEM HAD A DYNAMIC RANGE OF APPROXIMATELY 1,000. THERE WAS PROVISION FOR THE INSTRUMENT ORIFICE TO BE COVERED DURING SPACECRAFT THRUSTER OPERATIONS. MORE EXPERIMENT DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 277-285, APRIL 1973.

----- AE-E, HINTEREGGER -----

INVESTIGATION NAME- SOLAR EUV SPECTROPHOTOMETER (EUVS)

NSSDC ID- 75-107A-06

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
SOLAR PHYSICS

PERSONNEL

PI - H.E. HINTEREGGER	USAF GEOPHYS LAB
OI - D.E. BEDO	USAF GEOPHYS LAB
OI - L.A. HALL	USAF GEOPHYS LAB
OI - J.E. MASON	USAF GEOPHYS LAB
OI - C.W. CHAGNON	USAF GEOPHYS LAB

BRIEF DESCRIPTION

EUVS WAS USED TO OBSERVE THE VARIATIONS IN THE SOLAR EUV FLUX IN THE WAVELENGTH RANGE FROM 140 TO 1850 Å AND THE ATMOSPHERIC ATTENUATION AT VARIOUS FIXED WAVELENGTHS. THIS PROVIDED QUANTITATIVE ATMOSPHERIC STRUCTURE AND COMPOSITION DATA. THE INSTRUMENT CONSISTED OF 24 GRAZING-INCIDENCE GRATING MONOCHROMATORS, USING PARALLEL-SLIT SYSTEMS FOR ENTRANCE COLLIMATION AND PHOTOELECTRIC DETECTORS AT THE EXIT SLITS. TWELVE OF THESE MONOCHROMATORS HAD WAVELENGTH SCAN CAPABILITY, EACH WITH 128 SELECTABLE WAVELENGTH POSITIONS WHICH COULD ALSO AUTOMATICALLY STEP SCAN THROUGH THESE POSITIONS. THE OTHER 12 MONOCHROMATORS OPERATED AT FIXED WAVELENGTHS WITH FIELDS OF VIEW SMALLER THAN THE FULL SOLAR DISK TO AID IN THE ATMOSPHERIC ABSORPTION ANALYSIS. THE SPECTRAL RESOLUTION VARIED FROM 2 TO 50 Å DEPENDING UPON THE PARTICULAR INSTRUMENT. THE FIELD OF VIEW VARIED FROM 60 X 60 DOWN TO 3 X 6 ARC MIN. ALL 24 MONOCHROMATOR-ENTRANCE AXES WERE CO-ALIGNED PARALLEL. A SOLAR POINTING SYSTEM COULD POINT TO 256 DIFFERENT POSITIONS, EXECUTE A 16-STEP ONE-DIMENSIONAL SCAN OR A FULL 256-STEP RASTER. THE TIME RESOLUTION VARIED FROM 0.5 S FOR OBSERVING 12 FIXED WAVELENGTHS UP TO 256 S FOR PROGRAMMING THE EUVS THROUGH ALL POSSIBLE MODES. MORE DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 305-314, APRIL 1973.

----- AE-E, RICE -----

INVESTIGATION NAME- OPEN-SOURCE NEUTRAL MASS SPECTROMETER (OSS)

NSSDC ID- 75-107A-07

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - A.O.C. NIER	U OF MINNESOTA
OI - W.E. POTTER	U OF MINNESOTA
OI - K. MAUERSBERGER	U OF MINNESOTA

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT WAS TO CONTRIBUTE TO A STUDY OF THE CHEMICAL, DYNAMIC, AND ENERGETIC PROCESSES THAT CONTROL THE STRUCTURE OF THE THERMOSPHERE BY PROVIDING DIRECT, IN SITU MEASUREMENTS OF BOTH MAJOR AND MINOR NEUTRAL ATMOSPHERIC CONSTITUENTS HAVING MASS'S IN THE RANGE FROM 1 TO 48 ATOMIC MASS UNITS (U). A DOUBLE-FOCUSING, MATTACH-HERZOG MAGNETIC DEFLECTION MASS SPECTROMETER WITH AN IMPACT ION SOURCE WAS FLOWN. TWO ION COLLECTORS WERE INCLUDED TO MEASURE IONS DIFFERING IN MASS BY A FACTOR OF 8; I.E., THE TWO MASS RANGES COVERED WERE 1 TO 8 AND 7 TO 48 U. IN THE ION SOURCE THE NEUTRAL SPECIES WAS IONIZED BY MEANS OF ELECTRON IMPACT. THE ELECTRON ENERGIES WERE SELECTABLES 75 EV FOR THE HIGH EV MODE AND 25 EV FOR THE LOW EV MODE. AT ALTITUDES GREATER THAN 380 KM, ION CURRENTS WERE MEASURED WITH AN ELECTRON MULTIPLIER COUNTING INDIVIDUAL IONS. COUNTS WERE ACCUMULATED FOR 1/20 S BEFORE AUTOMATICALLY SWITCHING TO A DIFFERENT MASS NUMBER. WHILE COMPLETE MASS SPECTRA COULD BE SWEEPED, IN THE COMMON MODE OF OPERATION PEAK STEPPING WAS EMPLOYED, WITH READINGS ON THE PRINCIPAL PEAKS IN THE MASS SPECTRUM BEING REPEATED APPROXIMATELY EVERY 0.5 S AND OTHER SPECIES LESS FREQUENTLY. DATA BELOW 380 KM WERE MEASURED USING AN ELECTROMETER. IN ADDITION TO THE PEAK STEPPING MODE, THERE WERE SEVERAL OTHER OPERATING MODES WHICH WERE SELECTED BY GROUND COMMAND. AMBIENT PARTICLES STRIKING THE ION SOURCE RETAIN ENERGIES LESS THAN 0.1 EV, WHICH IS NOT HIGH ENOUGH TO OVERCOME THE NEGATIVE SPACE CHARGE POTENTIAL HOLDING THE IONS IN THE BEAM. THOSE AMBIENT PARTICLES THAT DID NOT STRIKE THE ION SOURCE RETAINED THEIR INCOMING ENERGY OF SEVERAL EV AFTER IONIZATION AND ESCAPE INTO THE ACCELERATING REGION OF THE ANALYZER. MORE EXPERIMENT DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 271-276, APRIL 1973.

----- AE-E, RICE -----

INVESTIGATION NAME- CAPACITANCE MANOMETER

NSSDC ID- 75-107A-12

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - C.J. RICE

AEROSPACE CORP

BRIEF DESCRIPTION

THE CAPACITANCE MANOMETER FLOWN ON AE-E WAS PRIMARILY AN ENGINEERING EXPERIMENT TO PROVIDE DATA ON SPACECRAFT OPERATIONS. HOWEVER, DATA FROM THIS EXPERIMENT WERE ALSO CORRELATED WITH ACCELEROMETER AND ION GAUGE DATA IN EVALUATING SATELLITE DRAG. THE MANOMETER, ALSO REFERRED TO AS PRESSURE SENSOR B (PSB), PROVIDED A DIRECT MEASURE OF ATMOSPHERIC PRESSURE IN THE REGION BELOW 200 KM. THE ACCURACY OF THE PSB GAUGE VARIED FROM ABOUT 10 PERCENT AT 120 KM TO ABOUT 40 PERCENT AT 180 KM. THE PSB CONSISTED OF TWO SPHERICAL, THERMLY CONTROLLED CHAMBERS, SEPARATED BY A THIN MEMBRANE STRETCHED FLAT AND UNDER RADIAL TENSION. ANY DEFLECTION OF THE DIAPHRAGM CAUSED BY A PRESSURE DIFFERENTIAL BETWEEN THE TWO SIDES CAUSED A CHANGE IN CAPACITANCE BETWEEN THE DIAPHRAGM AND AN ADJACENT ELECTRODE WHICH BIASED AN AC BRIDGE CIRCUIT. AIR WAS ALLOWED INTO ONE OF THE CHAMBERS THROUGH TWO PORTS 180 DEG APART AND PERPENDICULAR TO THE SPACECRAFT SPIN AXIS. THUS THE WAKE-RAM PRESSURE DIFFERENTIAL WAS SAMPLED TWICE EACH SPACECRAFT REVOLUTION. MORE DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 305-314, APRIL 1973.

----- AE-E, RICE -----

INVESTIGATION NAME- COLD CATHODE ION GAUGE

NSSDC ID- 75-107A-13

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - C.J. RICE

AEROSPACE CORP

BRIEF DESCRIPTION

THE COLD CATHODE-ION GAUGE WAS PRIMARILY AN ENGINEERING EXPERIMENT TO PROVIDE DATA ON SPACECRAFT OPERATION. HOWEVER, DATA FROM THIS EXPERIMENT WERE CORRELATED WITH ACCELEROMETER AND CAPACITANCE MANOMETER DATA TO EVALUATE SATELLITE DRAG PERFORMANCE. THE ION GAUGE, ALSO REFERRED TO AS PRESSURE SENSOR A (PSA), MEASURED ATMOSPHERIC PRESSURE IN THE REGION BETWEEN 120 AND 370 KM ABOVE THE EARTH'S SURFACE FOR VALUES OF ATMOSPHERIC PRESSURE BETWEEN 1.3E-3 AND 1.3E-7 MB. THE ESTIMATED ACCURACY OF THE PSA WAS PLUS OR MINUS 20 PERCENT. THE CYLINDRICALLY-SHAPED SENSOR PACKAGE CONSISTED OF A WEDGE-SHAPED ORIFICE, A CATHODE NEAR GROUND POTENTIAL, AN ANODE OPERATING AT ABOUT 1300 VDC, AND A PERMANENT MAGNETIC FIELD OF ABOUT 0.16T (1600 GAUSS). THE GAUGE CONTAINED NO PRIMARY SOURCE OF IONIZING ELECTRONS. THE DISCHARGE WAS INITIATED BY FIELD EMISSION AND WAS SELF-SUSTAINING AT A PRESSURE ABOVE 1.3E-7 MB. THE ION CURRENT WAS COLLECTED AT THE CATHODE. THE SENSOR WAS MOUNTED ON THE SPACECRAFT, WITH THE ORIFICE PERPENDICULAR TO THE SPACECRAFT SPIN AXIS, WHICH WAS NORMAL TO THE ORBITAL PLANE. THE INSTRUMENT WAS OPERATED IN TWO MODES, SPINNING AND DESPIN. WHEN THE SPACECRAFT WAS IN A SPINNING MODE, THE PSA ALTERNATELY SAMPLED THE RAM AND WAKE PRESSURE. WHEN THE SPACECRAFT WAS IN THE DESPIN MODE, THE PSA FACED 30 DEG FROM THE DIRECTION OF MOTION. DATA FROM THIS EXPERIMENT WERE NOT TAPE RECORDED, BUT OBSERVED IN REAL TIME. MORE DETAILS CAN BE FOUND IN 'RADIO SCIENCE,' 8, 4, 305-314, APRIL 1973.

----- AE-E, SPENCER -----

INVESTIGATION NAME- NEUTRAL ATMOSPHERE TEMPERATURE (NATE)

NSSDC ID- 75-107A-09

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - N.W. SPENCER	NASA-GSFC
OI - G.R. CARIGNAN	U OF MICHIGAN
OI - H.B. NIEMANN	NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO MEASURE THE KINETIC TEMPERATURE OF THE NEUTRAL ATMOSPHERE BY DETERMINING THE INSTANTANEOUS DENSITY OF MOLECULAR NITROGEN IN A SPHERICAL CHAMBER COUPLED TO THE ATMOSPHERE THROUGH A KNIFE-EDGED ORIFICE. ANALYSIS OF THE MEASURED MOLECULAR NITROGEN DENSITY VARIATION OVER A SPIN CYCLE WITH A KNOWLEDGE OF THE SATELLITE'S MOTION AND ORIENTATION LED TO A DETERMINATION OF THE AMBIENT TEMPERATURE, INDEPENDENT OF SCALE HEIGHT. MEASUREMENTS OF THE AMBIENT NITROGEN DENSITY AND NEUTRAL WIND WERE ALSO OBTAINED. AN ALTERNATE MEASUREMENT OF NEUTRAL TEMPERATURE WAS ALSO UNDERTAKEN, USING A BAFFLE INSERTED IN FRONT OF THE ORIFICE TO INTERCEPT A PORTION OF THE GAS PARTICLE STREAM ENTERING THE CHAMBER. WHEN THE SATELLITE WAS IN THE DESPIN MODE, THE BAFFLE WAS MADE TO OSCILLATE IN A STEPWISE FASHION IN ORDER TO INTERRUPT THE PARTICLE STREAM SEEN BY THE ORIFICED CHAMBER. THESE CHAMBER DENSITY VARIATIONS WERE INTERPRETED TO YIELD THE

NEUTRAL GAS KINETIC TEMPERATURE ALSO. A DUAL-FILAMENT ION SOURCE SAMPLED THE THERMALIZED MOLECULAR NITROGEN IN THE CHAMBER AND PRODUCED AN ION BEAM DENSITY PROPORTIONAL TO THE NITROGEN CHAMBER DENSITY. FROM THE SOURCE, THIS IONIZED NITROGEN BEAM WAS DIRECTED INTO A QUADRUPOLE ANALYZER, TUNED TO PASS THOSE PARTICLES WHOSE MASS-TO-CHARGE RATIO (M/E) IS 28, AND ON TO AN ELECTRON MULTIPLIER. THE OUTPUT PULSES WERE AMPLIFIED AND COUNTED. THE SENSOR WAS VACUUM-SEALED PRIOR TO LAUNCH AND OPENED TO THE ATMOSPHERE AFTER THE SPACECRAFT WAS IN ORBIT. MORE EXPERIMENT DETAILS CAN BE FOUND IN 'RADIO SCIENCE', 8, 4, 287-296, APRIL 1973.

\*\*\*\*\* BHASKARA\*\*\*\*\*

SPACECRAFT COMMON NAME- BHASKARA  
ALTERNATE NAMES- SEO, 11392

NSSDC ID- 79-051A

LAUNCH DATE- 06/07/79  
LAUNCH SITE- KAPUSTIN YAR, U.S.S.R.  
LAUNCH VEHICLE- INTRACOS

SPONSORING COUNTRY/AGENCY

INDIA  
U.S.S.R.  
ISRO  
UNKNOWN

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 95.2 MIN  
PERIAPSIS- 512. KM ALT

WEIGHT- 444. KG

PERSONNEL

MG - U.R. RAO  
PD - K. KASTURIRANGAN  
PS - D.P.N.CALLA  
PS - G. JOSEPH

ISRO SATELLITE CENTER  
ISRO SATELLITE CENTER  
SPACE APPLICATIONS CTR  
SPACE APPLICATIONS CTR

BRIEF DESCRIPTION

BHASKARA, THE SECOND INDIAN SATELLITE, WAS LAUNCHED AS PART OF THEIR SATELLITE FOR EARTH OBSERVATIONS (SEO) PROGRAM. IT WAS PLACED IN ORBIT BY A U.S.S.R. VEHICLE LAUNCHED FROM A COSMODROME IN THE U.S.S.R. THE MAIN OBJECTIVES WERE TO CONDUCT EARTH OBSERVATION EXPERIMENTS FOR APPLICATIONS RELATED TO HYDROLOGY, FORESTRY, AND GEOLOGY USING A TWO-BAND TV CAMERA SYSTEM, AND TO CONDUCT OCEAN SURFACE STUDIES USING A TWO-FREQUENCY SATELLITE MICROWAVE RADIOMETER (SAMIR) SYSTEM. SECONDARY OBJECTIVES WERE TO TEST ENGINEERING AND DATA PROCESSING SYSTEMS, TO COLLECT LIMITED METEOROLOGICAL DATA FROM REMOTE PLATFORMS, AND TO CONDUCT SCIENTIFIC INVESTIGATIONS IN X-RAY ASTRONOMY. BHASKARA WAS A 26-FACED QUASI-SPHERICAL POLYHEDRON. IT HAD A HEIGHT OF 1.66 M. AND DIAM OF 1.55 M.

\*\*\*\*\* BHASKARA, CALLA\*\*\*\*\*

INVESTIGATION NAME- SATELLITE MICROWAVE RADIOMETER (SAMIR)

NSSDC ID- 79-051A-01

INVESTIGATIVE PROGRAM  
APPLICATIONS

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL

PI - D.P.N.CALLA

SPACE APPLICATIONS CTR

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO CONDUCT STUDIES OVER THE INDIAN CONTINENT AND SURROUNDING SEAS USING A 19 AND 23 GHZ MICROWAVE RADIOMETRIC SYSTEM.

\*\*\*\*\* BHASKARA, JOSEPH\*\*\*\*\*

INVESTIGATION NAME- TV CAMERA

NSSDC ID- 79-051A-02

INVESTIGATIVE PROGRAM  
APPLICATIONS

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL

PI - G. JOSEPH

SPACE APPLICATIONS CTR

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO CONDUCT EARTH OBSERVATION STUDIES FOR APPLICATIONS RELATED TO HYDROLOGY, FORESTRY AND GEOLOGY USING A TWO-BAND TV CAMERA SYSTEM.

\*\*\*\*\* BHASKARA, KAMAT\*\*\*\*\*

INVESTIGATION NAME- DATA COLLECTION PLATFORM

NSSDC ID- 79-051A-07

INVESTIGATIVE PROGRAM  
APPLICATIONS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

ORIGINAL PAGE IS  
OF POOR QUALITY

PERSONNEL

PI - D.S. KAMAT  
OI - S. KALYANARAMAN

SPACE APPLICATIONS CTR  
ISRO SATELLITE CENTER

BRIEF DESCRIPTION

THIS INVESTIGATION WAS DESIGNED TO COLLECT DATA OF METEOROLOGICAL INTEREST FROM REMOTELY LOCATED PLATFORMS.

----- BHASKARA, KASTURIRANGAN-----

INVESTIGATION NAME- PINHOLE X-RAY SKY SURVEY

NSSDC ID- 79-051A-03

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - K. KASTURIRANGAN  
OI - P.C. AGARWAL

ISRO SATELLITE CENTER  
TATA INST OF FUND RES

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO MONITOR AND SURVEY X-RAY SOURCES IN THE SKY.

\*\*\*\*\* COS-B\*\*\*\*\*

SPACECRAFT COMMON NAME- COS-B

ALTERNATE NAMES- COSMIC RAY SATELLITE-B, PL-741B

NSSDC ID- 75-072A

LAUNCH DATE- 08/09/75

WEIGHT- 277.5 KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

INTERNATIONAL  
ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 2227.0 MIN

EPOCH DATE- 08/12/75  
INCLINATION- 90.13 DEG

PERIAPSIS- 339.6 KM ALT

PERSONNEL

PM - G. ALTMANN  
PS - R.D. WILLS

ESA-ESTEC  
ESA-ESTEC

BRIEF DESCRIPTION

THE COS-B SCIENTIFIC SATELLITE WAS DEVELOPED BY THE EUROPEAN SPACE AGENCY (ESA) TO STUDY EXTRATERRESTRIAL GAMMA RADIATION IN THE 25-MEV TO 1-GEV ENERGY RANGE FROM A HIGHLY ELLIPTICAL ORBIT OF ROUGHLY 100-000-KM APOGEE, 350-KM PERIGEE, AND NEAR-POLAR INCLINATION. NASA PROVIDED, ON A FULLY REIMBURSABLE BASIS, THE DELTA LAUNCH VEHICLE AND THE ASSOCIATED LAUNCH SERVICES. THE COS-B SPACECRAFT WAS A CYLINDER WITH A DIAMETER OF 140 CM AND A HEIGHT OF 121 CM. FOUR MONOPOLE ANTENNAS, PROTRUDING 51.2 CM BELOW THE BOTTOM OF THE CYLINDRICAL BODY, GAVE THE SPACECRAFT A TOTAL EFFECTIVE HEIGHT OF 172.2 CM. THE SPACECRAFT OBTAINED ORIENTATION OF ITS MOMENTUM VECTOR WITH RESPECT TO INERTIAL SPACE USING DATA FROM AN EARTH ALBEDO SENSOR AND A SOLAR SENSOR. SPACECRAFT ATTITUDE WAS ADJUSTED BY A NITROGEN COLD-GAS ATTITUDE CONTROL SYSTEM (ACS). THE ACS INCLUDED TWO SPIN-RATE-ADJUST NOZZLES TO MAINTAIN THE SPIN RATE AT 10 RPM AND TWO PRECESSION NOZZLES TO ADJUST THE MOMENTUM VECTOR. THE SPACECRAFT HAD A PCW/PSK/PM TELEMETRY SYSTEM WITH 6.5-MW REAL-TIME-ONLY TRANSMITTER PROVIDING A SWITCHABLE BIT RATE OF 160 AND 320 BPS AND A PCW/PSK/PM UP-LINK/DOWN-LINK, RANGE-TONE COMMAND SYSTEM. POWER WAS SUPPLIED BY 9460 SOLAR CELLS MOUNTED ON 12 SUPPANELS ON THE CYLINDRICAL BODY OF THE SPACECRAFT. COMMUNICATIONS, COMMAND, AND CONTROL OF THE COS-B SATELLITE IN ORBIT WERE PROVIDED BY THE ESA ESTRACK NETWORK. THE SPACECRAFT ENCLOSED A GAMMA-RAY ASTRONOMY EXPERIMENT DESCRIBED UNDER 'COS-B CARAVANE COLLABORATION' BELOW. MEMBERS OF THE UNIVERSITY AND RESEARCH GROUPS WHO IMPLEMENTED THIS SATELLITE ARE LISTED IN APPENDIX B2 WITH THEIR AFFILIATIONS.

----- COS-B, CARAVANE COLLABOR.-----

INVESTIGATION NAME- GAMMA-RAY ASTRONOMY SPARK CHAMBER  
EXPERIMENT (25 - 1000 MEV)

NSSDC ID- 75-072A-01

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - CARAVANE COLLABOR.

SEE APPENDIX B2

BRIEF DESCRIPTION

THIS EXPERIMENT USED A 16-DECK SPARK CHAMBER TO PERFORM GAMMA-RAY ASTRONOMY IN THE 25- TO 1000- MEV ENERGY INTERVAL. THE MISSION GOALS WERE -- (1) TO STUDY THE ANGULAR STRUCTURE OF THE SO-CALLED LINE-SOURCE OF RADIATION IN THE GALACTIC PLANE; (2) TO EXAMINE IDENTIFIED POINT SOURCES AND TO INVESTIGATE OTHER CELESTIAL OBJECTS, WHICH MAY BE EXPECTED TO EMIT GAMMA-RAYS (E.G., SUPERNOVA REMNANTS, QUASARS, NOVAE, ETC.); (3) TO MEASURE THE INTENSITY OF THE ISOTROPIC RADIATION FROM HIGH GALACTIC LATITUDES; (4) TO ASCERTAIN THE ENERGY SPECTRA OF

RADIATION FROM ALL OBSERVED SOURCES, (B) TO SEARCH FOR LONG-TERM VARIATIONS IN THE STRENGTH OF SOURCES, AND (C) TO SEARCH FOR SHORT-PERIOD PULSATIONS FROM SOURCES ALREADY KNOWN TO BE PULSARS AT OTHER WAVELENGTHS AND TO DETECT GAMMA-RAY BURSTS. THE INSTRUMENT CONTAINED THE FOLLOWING KEY ELEMENTS (TOP TO BOTTOM) -- (1) ANTICOINCIDENCE SCINTILLATION DOME, (2) 16-DECK SPARK CHAMBER (SC), (3) TRIGGERING TELESCOPE (TT), (4) ENERGY CALORIMETER (E), AND (5) CASCADE-PARTICLE PLASTIC SCINTILLATOR COUNTER (B). THE ANTICOINCIDENCE COUNTER WAS A DOME OF SCINTILLATION PLASTIC, 10-MM THICK, VIEWED BY NINE PHOTOMULTIPLIER TUBES (PMT). IT DETECTED THE ENTRY OF CHARGED PARTICLES AND INHIBITED THE TRIGGERING OF THE SC. THE SC HAD 16 DECKS, EACH COMPOSED OF A PAIR OF ORTHOGONAL GRIDS OF 192 PARALLEL WIRES. THE TOP 12 DECKS WERE INTERLEAVED WITH TUNGSTEN PLATES AND THE LOWER 4 DECKS WITH MOLYBDENUM PLATES. THE SC WAS FILLED WITH NEON AT 12 ATM, PLUS A SMALL PERCENTAGE OF ETHANE. UPON CONVERSION OF A GAMMA RAY INTO AN ELECTRON-POSITRON PAIR, AN 8-KV VOLTAGE PULSE WAS APPLIED ACROSS THE DECKS CAUSING SPARK DISCHARGE ALONG THE IONIZATION TRACKS OF THE PAIR FROM WHICH THE ARRIVAL DIRECTION OF THE GAMMA RAY COULD BE DETERMINED. THE RECHARGE TIME OF THE SC HIGH VOLTAGE WAS 0.1 S. THE TT CONSISTED OF THREE ELEMENTS -- A 6-MM-THICK SCINTILLATION COUNTER (B1) ABLE TO IDENTIFY EVENTS IN WHICH AN E-P PAIR LEFT THE SC, A CERENKOV COUNTER (C) OF 30-MM-THICK PLEXIGLASS THAT WAS SENSITIVE TO RELATIVISTIC PARTICLES MOVING IN A DOWNWARD DIRECTION, AND A SECOND SCINTILLATOR (B2) 10-MM THICK. THE PRIMARY OBJECTIVES OF THE TT WERE TO DEFINE THE FIELD OF VIEW, TO DETECT THE DOWNWARD-MOVING ELECTRONS, AND TO PROVIDE THE FAST TRIGGER TO DISCHARGE THE SC. IT WAS POSSIBLE TO RESTRICT THE FIELD OF VIEW OF THE INSTRUMENT BY THE DIVISION OF THE C AND B2 COUNTERS INTO QUADRANTS, WHICH WERE VIEWED BY PMT OUTSIDE THE FIELD OF VIEW. THE PMT OUTPUTS WERE PULSE-HEIGHT ANALYSED TO PROVIDE INFORMATION ON THE NUMBERS OF PARTICLES LEAVING THE SC AND ENTERING THE CALORIMETER, E. THE E UNIT WAS A SINGLE CRYSTAL OF CESIUM IODIDE, 4.5 RADIATION LENGTHS THICK, IN WHICH THE E-P PAIR INITIATED AN ELECTRON-PHOTON CASCADE THAT WAS COMPLETELY ABSORBED AT LOW ENERGIES. AT HIGHER ENERGIES THE CASCADE PENETRATED TO THE FINAL PLASTIC SCINTILLATOR COUNTER, B. THE OUTPUT OF B WAS ANALYZED TO MEASURE THE NUMBER OF PARTICLES ESCAPING. INFORMATION FROM THE TT COUNTERS AND FROM THE SC PROVIDED A MEASURE OF THE ENERGY LOST BY SCATTERING OR ABSORPTION. THIS QUANTITY MUST BE ADDED TO THE CALORIMETER SIGNAL TO DERIVE THE ENERGY OF THE INCIDENT GAMMA RAY. THE ANTICOINCIDENCE DOME WAS INSTRUMENTED TO DETECT GAMMA-RAY BURSTS, AND A SMALL 80-SQ CM ARGON-FILLED PROPORTIONAL COUNTER SENSITIVE TO X-RAYS BETWEEN 2 AND 12 KEV VIEWED PARALLEL TO THE AXES OF THE MAIN GAMMA-RAY INSTRUMENT TO PROVIDE CONTEMPORARY X-RAY DATA ON AXIALLY LOCATED SOURCES.

\*\*\*\*\* COSMOS 900 \*\*\*\*\*

SPACECRAFT COMMON NAME- COSMOS 900  
ALTERNATE NAMES- 09898, OVAL

NSSDC ID- 77-023A

LAUNCH DATE- 03/30/77 WEIGHT- 900. KG  
LAUNCH SITE- PLESetsk, U.S.S.R.  
LAUNCH VEHICLE- C-1

SPONSORING COUNTRY/AGENCY  
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 96.4 MIN  
PERIASTRIS- 460. KM ALT

EPOCH DATE- 03/31/77  
INCLINATION- 83. DEG  
APOASTRIS- 523. KM ALT

PERSONNEL  
PM - K.I. GRINGAUZ  
OI - B.A. TVERSKOV

IKI  
INST NUCLEAR PHYSICS

BRIEF DESCRIPTION  
SPUTNIK COSMOS 900 CARRIED SCIENTIFIC APPARATUS, A RADIO SYSTEM FOR PRECISE MEASUREMENTS OF ORBIT ELEMENTS, AND A RADIO TELEMETRY SYSTEM.

\*\*\*\*\* COSMOS 900, AFONIN \*\*\*\*\*

INVESTIGATION NAME- FLAT RETARDING POTENTIAL ANALYZER

NSSDC ID- 77-023A-01 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - V.V. AFONIN  
OI - V.V. BEZRUKIKH

IKI  
IKI

BRIEF DESCRIPTION  
NO INFORMATION GIVEN ON THE EXPERIMENT OTHER THAN THE NAMES SUPPLIED.

\*\*\*\*\* COSMOS 900, AFONIN \*\*\*\*\*

INVESTIGATION NAME- HIGH-FREQUENCY ELECTRON TEMPERATURE PROBE

NSSDC ID- 77-023A-02 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - V.V. AFONIN  
OI - J.I. SMILAUER

IKI  
GEOPHYS INST CAS

BRIEF DESCRIPTION

THE RADIO FREQUENCY PROBE WAS OPERATED IN REAL TIME AND TWO DIFFERENT STORAGE MODES. THE FIRST STORAGE MODE FILLED THE ON-BOARD MEMORY IN ONE ORBIT; WHILE IN THE DAY MODE, IT REQUIRED ONE DAY TO FILL MEMORY. RESULTS OF ELECTRON TEMPERATURE WERE OBTAINED ASSURING A MAXWELLIAN VELOCITY DISTRIBUTION RATHER THAN RECORDING I-V CURVES. THE NORMAL SPACECRAFT POTENTIAL OF -1 TO -3V WAS EXCEEDED DURING LONG PERIODS ON THE SUNLIT PORTIONS OF THE ORBIT WHERE VALUES UP TO -15V WERE EXPERIENCED.

\*\*\*\*\* COSMOS 900, GDALEVICH \*\*\*\*\*

INVESTIGATION NAME- SPHERICAL ION TRAP WITH FLOATING POTENTIAL

NSSDC ID- 77-023A-03 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - G.L. GDALEVICH  
OI - V.D. OZEROV

IKI  
IKI

BRIEF DESCRIPTION

NO INFORMATION GIVEN ON THE EXPERIMENT OTHER THAN THE NAMES SUPPLIED.

\*\*\*\*\* COSMOS 900, GDALEVICH \*\*\*\*\*

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBE

NSSDC ID- 77-023A-04 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - G.L. GDALEVICH  
OI - V.F. GUDSKY

IKI  
IKI

BRIEF DESCRIPTION

NO INFORMATION GIVEN ON THE EXPERIMENT OTHER THAN THE NAMES SUPPLIED.

\*\*\*\*\* COSMOS 900, GORTCHAKOV \*\*\*\*\*

INVESTIGATION NAME- RELATIVISTIC PROTON AND ELECTRON COUNTER

NSSDC ID- 77-023A-05 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - V.E. V.GORTCHAKOV

INST NUCLEAR PHYSICS

BRIEF DESCRIPTION

NO INFORMATION GIVEN ON THE EXPERIMENT OTHER THAN THE NAMES SUPPLIED.

\*\*\*\*\* COSMOS 900, SCHUTTE \*\*\*\*\*

INVESTIGATION NAME- PANORAMIC ELECTROSTATIC SPECTROMETER

NSSDC ID- 77-023A-07 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - M.M. SCHUTTE

IKI

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURED ELECTRONS AND PROTONS FROM 0.1 TO 20 KEV.

----- COSMOS 908, SOSNOVETS -----

INVESTIGATION NAME- DIFFERENTIAL ENERGY SPECTROMETER

NSSDC ID- 77-023A-09

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - E.N. SOSNOVETS  
OI - N.I. PANASYUK

INST NUCLEAR PHYSICS  
INST NUCLEAR PHYSICS

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURED TRAPPED ELECTRONS AND PROTONS USING JUNCTION SPECTROMETERS. ONE PROTON DETECTOR WITH AN ANGULAR APERTURE OF 60 DEG (GEOMETRIC FACTOR OF 0.3 SQ CM-SR) COVERED THE ENERGY RANGE 1-3 KEV, AND THE OTHER PROTON DEVICE WITH AN 18-DEG ANGULAR APERTURE (GEOMETRIC FACTOR OF 0.0084 SQ CM-SR) COVERED THE RANGE 80-150 KEV. THE ELECTRON DETECTOR WITH AN ANGULAR APERTURE OF 15 DEG (GEOMETRIC FACTOR OF 0.0054 SQ CM-SR) COVERED THE RANGE 80-150 KEV. FOR L > 3, THE ANGLE BETWEEN THE DETECTOR AXES AND THE GEOMAGNETIC FIELD WAS 60 PLUS OR MINUS 10 DEG.

HAD THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEM WHICH SUPPORTS (4) A 9.29 SQ M SOLAR CELL PANEL. THE BLOCK 5D SPACECRAFT STABILIZATION WAS CONTROLLED BY A COMBINATION FLYNNHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS COULD BE MAINTAINED IN THE DESIRED 'EARTH-LOOKING' MODE. ONE FEATURE OF BLOCK 5D WAS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND AN UPDATED EPHemeris NAVIGATION SYSTEM. THIS ALLOWED AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, WAS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDED REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 1/8 NAUTICAL MILE RESOLUTION FOR ALL MAJOR LAND MASSES, 1-1/2 NAUTICAL MILE RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDED WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR H (SSH), A STEP-SCANNING RADIOMETER, WAS THE INFRARED TEMPERATURE-HUMIDITY-OZONE SOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDES THREE HIGH-DENSITY TAPE RECORDERS, COULD STORE A TOTAL OF 400 MIN OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA WERE TRANSMITTED TO GROUND-RECEIVING SITES VIA TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA WERE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WA, AND LORING AFB, ME, AND RELAYED VIA SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA WERE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE BLOCK 5D SATELLITE CAN BE FOUND IN THE REPORT, 'THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1975.

----- COSMOS 908, TELTSOV -----

INVESTIGATION NAME- DIFFERENTIAL LOW ENERGY SPECTROMETER

NSSDC ID- 77-023A-06

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - N.V. TELTSOV

INST NUCLEAR PHYSICS

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURED ELECTRONS AND PROTONS FROM 0.5 TO 20 KEV.

----- COSMOS 900, TULUPOV -----

INVESTIGATION NAME- AURORAL PHOTOMETER

NSSDC ID- 77-023A-09

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - V.I. TULUPOV

INST NUCLEAR PHYSICS

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURED AURORAL LIGHT EMISSIONS AT 3914 A.

\*\*\*\*\* DMSP 5D-1/F1 \*\*\*\*\*  
SPACECRAFT COMMON NAME- DMSP 5D-1/F1  
ALTERNATE NAMES- DMSP 12535, DMSP BLOCK 5D-1  
09415, DMSPSD1  
DMSP-F1

NSSDC ID- 76-091A

LAUNCH DATE- 09/11/76 WEIGHT- 450. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY  
UNITED STATES

DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101.6 MIN  
PERIAPSIS- 818. KM ALT

EPOCH DATE- 09/14/76  
INCLINATION- 98.7 DEG  
APOAPSIS- 848. KM ALT

PERSONNEL

PM - J.J. MCGLINCHY

USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSP-5D-1/F1 WAS ONE OF A SERIES OF METEOROLOGICAL SATELLITES DEVELOPED AND OPERATED BY THE AIR FORCE UNDER THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP). THIS PROGRAM, PREVIOUSLY KNOWN AS DAPP (DATA ACQUISITION AND PROCESSING PROGRAM), WAS CLASSIFIED UNTIL MARCH 1973. THE OBJECTIVES OF THIS PROGRAM WERE TO PROVIDE GLOBAL VISUAL AND INFRARED CLOUD COVER DATA AND SPECIALIZED ENVIRONMENTAL DATA TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS. OPERATIONALLY, THE PROGRAM CONSISTED OF TWO SATELLITES IN PLANNED 850-KM SUN-SYNCHRONOUS POLAR ORBITS, WITH THE ASCENDING NODE OF ONE SATELLITE IN EARLY MORNING AND THE OTHER AT LOCAL NOON. THE 5.4-M-LONG SPACECRAFT WAS SEPARATED INTO FOUR SECTIONS: (1) A PRECISION MOUNTING PLATFORM (PMP) FOR SENSORS AND EQUIPMENT REQUIRING PRECISE ALIGNMENT, (2) AN EQUIPMENT SUPPORT MODULE (ESM) CONTAINING THE ELECTRONICS, REACTION WHEELS, AND SOME METEOROLOGICAL SENSORS, (3) A REACTION CONTROL EQUIPMENT (RCE) SUPPORT STRUCTURE (THAT

HAD THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEM WHICH SUPPORTS (4) A 9.29 SQ M SOLAR CELL PANEL. THE BLOCK 5D SPACECRAFT STABILIZATION WAS CONTROLLED BY A COMBINATION FLYNNHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS COULD BE MAINTAINED IN THE DESIRED 'EARTH-LOOKING' MODE. ONE FEATURE OF BLOCK 5D WAS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND AN UPDATED EPHemeris NAVIGATION SYSTEM. THIS ALLOWED AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, WAS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDED REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 1/8 NAUTICAL MILE RESOLUTION FOR ALL MAJOR LAND MASSES, 1-1/2 NAUTICAL MILE RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDED WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR H (SSH), A STEP-SCANNING RADIOMETER, WAS THE INFRARED TEMPERATURE-HUMIDITY-OZONE SOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDES THREE HIGH-DENSITY TAPE RECORDERS, COULD STORE A TOTAL OF 400 MIN OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA WERE TRANSMITTED TO GROUND-RECEIVING SITES VIA TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA WERE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WA, AND LORING AFB, ME, AND RELAYED VIA SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA WERE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE BLOCK 5D SATELLITE CAN BE FOUND IN THE REPORT, 'THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1975.

----- DMSP 5D-1/F1, AFGWC STAFF -----

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 76-091A-01

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SVS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

THE OPERATIONAL LINESCAN SYSTEM (OLS) WAS THE PRIMARY EXPERIMENT ON THE DMSP BLOCK 5D SPACECRAFT. THE PURPOSE OF THIS EXPERIMENT WAS TO PROVIDE GLOBAL, DAY/NIGHT OBSERVATIONS OF CLOUD COVER AND CLOUD TEMPERATURE MEASUREMENTS TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS FOR OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE OLS EMPLOYED A SCANNING OPTICAL TELESCOPE DRIVEN IN AN OSCILLATING MOTION, WITH OPTICAL COMPENSATION FOR IMAGE MOTION, WHICH RESULTED IN NEAR-CONSTANT RESOLUTION THROUGHOUT THE SENSOR FIELD OF VIEW. THE RADIOMETER OPERATED IN TWO ("LIGHT" AND "THERMAL") SPECTRAL INTERVALS -- (1) VISIBLE AND NEAR-INFRARED (0.4 TO 1.1 MICRORAMETERS) AND (2) INFRARED (8 TO 13 MICRORAMETERS). THE RADIOMETER PRODUCED, WITH ONBOARD PROCESSING, DATA IN FOUR MODES -- LF (LIGHT FINE) AND TF (THERMAL FINE) DATA WITH A RESOLUTION OF .56 KM, AND LS (LIGHT SMOOTHED) AND TS (THERMAL SMOOTHED) DATA WITH A RESOLUTION OF 2.8 KM. THERE WERE THREE ONBOARD RECORDERS, AND EACH HAD A STORAGE CAPABILITY OF 400 MIN OF BOTH LS AND TS DATA OR 20 MIN OF LF AND TF DATA. FOR DIRECT READOUT TO TACTICAL SITES, THE EXPERIMENT WAS PROGRAMMED SO THAT LF AND TS DATA WERE OBTAINED AT NIGHT. THE INFRARED DATA (TF AND TS) COVERED A TEMPERATURE RANGE OF 210 TO 310 DEG K WITH AN ACCURACY OF 1 DEG C. THE LS DATA MODE PROVIDED VISUAL DATA THROUGH A DYNAMIC RANGE FROM FULL SUNLIGHT DOWN TO A QUARTER MOON. THIS MODE ALSO AUTOMATICALLY ADJUSTED THE GAIN ALONG SCAN TO ALLOW USEFUL DATA TO BE OBTAINED ACROSS THE TERMINATOR. ADDITIONAL INFORMATION ON THIS EXPERIMENT IS CONTAINED IN THE REPORT, 'PRIMARY OPTICAL SUBSYSTEMS FOR DMSP BLOCK 5D,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY-AUGUST 1975.

----- DMSP 5D-1/F1, BLAKE -----

INVESTIGATION NAME- RADIATION DOSIMETER

NSSDC ID- 76-091A-03

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - J.B. BLAKE  
OI - S.J. IMAROTO  
OI - M. KATZ  
OI - W.A. KOLASINSKI

AEROSPACE CORP  
AEROSPACE CORP  
AEROSPACE CORP  
AEROSPACE CORP

BRIEF DESCRIPTION

THE PURPOSE OF THE GFE-3R DOSIMETER WAS TO MEASURE THE RADIATION DOSE IN SILICON UNDER ALUMINUM SHIELDING OF FOUR THICKNESSES REPRESENTATIVE OF BLOCK 5D DMSP SPACECRAFT. THE DOSIMETER, BUILT BY THE AEROSPACE CORPORATION SPACE SCIENCE LABORATORY, CONSISTED OF FOUR SEPARATE, SINGLE-DETECTOR UNITS. THESE OMNIDIRECTIONAL SENSORS WERE SMALL, CUBICAL, LITHIUM-DRIFTED, SILICON DETECTORS CENTERED UNDER HEMISPHERICAL SHELLS, AND HEAVILY SHIELDED (RELATIVE TO THE HEMISPHERICAL SHELL) OVER THE REAR 2 PI SOLID ANGLE. THE SHIELDING DOMES FOR THE FOUR SENSORS WERE 35, 75, 125, AND 200 MILS OF ALUMINUM, RESPECTIVELY. THE DOSIMETER DIRECTLY MEASURED THE IONIZATION IN THE SILICON CUBE CAUSED BY THE NATURAL RADIATION AND SERVED

AS AN ELECTRON-PROTON SPECTROMETER, THUS YIELDING THE FLUENCES OF ENERGETIC ELECTRONS AND PROTONS ENCOUNTERED IN THE DMSP ORBIT. AS A FUNCTION OF TIME, FOUR INTEGRAL DISCRIMINATORS, WITH THRESHOLDS CORRESPONDING TO DEPOSITED ENERGY OF 25, 75, 300, AND 5000 KEV, WERE USED TO ANALYZE THE PULSE-HEIGHT SPECTRUM OF SIGNALS PRODUCED BY PROTONS, ELECTRONS, AND GAMMA RAYS ENTERING THE DETECTOR. INDIVIDUAL PULSES FROM THE 25, 300, AND 5000 KEV CHANNELS WERE COUNTED IN SCALING REGISTERS, WHICH ARE READ OUT AND RESET BY THE TELEMETRY SYSTEM EVERY THREE S. PULSES, WHOSE AMPLITUDES EXCEED THE GATING THRESHOLDS OF 25 KEV AND 75 KEV, WERE INTEGRATED INTO 1 KEV EQUIVALENT ENERGY PULSES (CORRESPONDING TO A DOSE OF 8.0E-6 RAD), WHICH WERE COUNTED BY A CUMULATIVE STORAGE REGISTER. THESE REGISTERS WERE READ OUT EVERY THREE SECONDS BUT NOT RESET BY THE TELEMETRY SO THAT THE NUMBER OF COUNTS READ OUT AT ANY TIME REPRESENTED THE TOTAL ENERGY IN KEV DEPOSITED IN THE SILICON ACTIVE VOLUME DURING THE MISSION LIFE. MAXIMUM ACCUMULATED DOSE STORAGE CORRESPONDED TO 5.8E9 RAD. ADDITIONAL INFORMATION CAN BE OBTAINED FROM AEROSPACE CORPORATION PUBLICATION NUMBER TOR-0077(2630)-1, JUNE 1977.

----- DMSP 5D-1/F1, SHRUM -----

#### INVESTIGATION NAME- GAMMA RAY DETECTOR

NSSDC ID- 76-091A-04

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY

#### PERSONNEL

PI - J. SHRUM

USAF TECH APPL CTR

#### BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF A FOUR-DETECTOR ARRAY OF CESIUM IODIDE SCINTILLATORS AND PHOTOMULTIPLIER TUBES EACH SURROUNDED BY A TANTALUM RING SHIELD TO PROVIDE A DIRECTIONAL SYSTEM. EACH DETECTOR WAS POSITIONED SO THAT ITS MOST SENSITIVE DIRECTION FACED 30 DEG FROM THE VERTICAL. PULSE-HEIGHT DISCRIMINATORS WERE USED TO PROVIDE GAMMA-RAY ENERGY LOSS THRESHOLDS OF 0.06, 0.15, AND 0.375 MEV. GAMMA RAYS PRODUCED IN THE ATMOSPHERE BY COSMIC RAYS, PRECIPITATING ELECTRONS, AND OTHER MEANS COULD BE MONITORED WITH THIS INSTRUMENT.

\*\*\*\*\* DMSP 5D-1/F2\*\*\*\*\*

SPACECRAFT COMMON NAME- DMSP 5D-1/F2  
ALTERNATE NAMES- DMSP 13536, DMSP BLCK 5D-1  
DMSP5D1, DMSP-F2

NSSDC ID- 77-044A

LAUNCH DATE- 06/05/77

WEIGHT- 450. KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- THOR

#### SPONSORING COUNTRY/AGENCY

UNITED STATES

DOD-USAF

#### INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC

EPOCH DATE- 06/06/77

ORBIT PERIOD- 101.7 MIN

INCLINATION- 99. DEG

PERIAPSIS- 811. KM ALT

APOAPSIS- 869. KM ALT

#### PERSONNEL

PM - J.J. MCGLINCHY

USAF SPACE DIVISION

#### BRIEF DESCRIPTION

DMSP 5D-1/F2 WAS ONE OF A SERIES OF METEOROLOGICAL SATELLITES DEVELOPED AND OPERATED BY THE AIR FORCE UNDER THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP). THIS PROGRAM, PREVIOUSLY KNOWN AS DAPP (DATA ACQUISITION AND PROCESSING PROGRAM), WAS CLASSIFIED UNTIL MARCH 1973. THE OBJECTIVES OF THIS PROGRAM WERE TO PROVIDE GLOBAL VISUAL AND INFRARED CLOUD COVER DATA AND SPECIALIZED ENVIRONMENTAL DATA TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS. OPERATIONALLY, THE PROGRAM CONSISTED OF TWO SATELLITES IN PLANNED 830-KM SUN-SYNCHRONOUS POLAR ORBITS, WITH THE ASCENDING NODE OF ONE SATELLITE IN EARLY MORNING AND THE OTHER AT LOCAL NOON. THE 5.4-M LONG SPACECRAFT WAS SEPARATED INTO FOUR SECTIONS: (1) A PRECISION MOUNTING PLATFORM (PMP) FOR SENSORS AND EQUIPMENT REQUIRING PRECISE ALIGNMENT, (2) AN EQUIPMENT SUPPORT PODULE (ESP) CONTAINING THE ELECTRONICS, REACTION WHEELS, AND SOME METEOROLOGICAL SENSORS, (3) A REACTION CONTROL EQUIPMENT (RCE) SUPPORT STRUCTURE (THAT HAS THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEM) WHICH SUPPORTS (4) A 9.29 SQ MM SOLAR CELL PANEL. THE SPACECRAFT STABILIZATION WAS CONTROLLED BY A COMBINATION FLYWHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS COULD BE MAINTAINED IN THE DESIRED "EARTH-LOOKING" MODE. ONE FEATURE WAS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND AN UPDATED EPHEMERIS NAVIGATION SYSTEM. THIS ALLOWED AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, WAS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDED REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 1/3-NAUTICAL-MILE RESOLUTION FOR ALL MAJOR LAND MASSES, 1-1/2-NAUTICAL-MILE RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDED WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO

THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR H (SSH), A STEP-SCANNING RADIOMETER, WAS THE INFRARED TEMPERATURE-HUMIDITY-OZONE BOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDES THREE HIGH-DENSITY TAPE RECORDERS, WAS CAPABLE OF STORING A TOTAL OF 400 MIN OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA WERE TRANSMITTED TO GROUND-RECEIVING SITES VIA TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA WERE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WAF, AND LORING AFB, ME, AND RELAYED VIA SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA WERE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE SATELLITE CAN BE FOUND ON THE REPORT, "THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM," D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1975.

----- DMSP 5D-1/F2, AFGWC STAFF -----

#### INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 77-044A-01

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SVS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

#### PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

#### BRIEF DESCRIPTION

THE OPERATIONAL LINESCAN SYSTEM (OLS) WAS THE PRIMARY EXPERIMENT ON THE DMSP 5D-1/F2 SPACECRAFT. THE PURPOSE OF THIS EXPERIMENT WAS TO PROVIDE GLOBAL, DAY/NIGHT OBSERVATIONS OF CLOUD COVER AND CLOUD TEMPERATURE MEASUREMENTS TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS FOR OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE OLS EMPLOYED A SCANNING OPTICAL TELESCOPE DRIVEN IN AN OSCILLATING MOTION, WITH OPTICAL COMPENSATION FOR IMAGE MOTION, WHICH RESULTED IN NEAR-CONSTANT RESOLUTION THROUGHOUT THE SENSOR FIELD OF VIEW. THE RADIOMETER OPERATED IN TWO ("LIGHT" AND "THERMAL") SPECTRAL INTERVALS: (1) VISIBLE AND NEAR INFRARED (0.4 TO 1.1 MICRONEETERS) AND (2) INFRARED (8 TO 13 MICRONEETERS). THE RADIOMETER PRODUCED, WITH ONBOARD PROCESSING, DATA IN FOUR MODES -- LF (LIGHT FINE) AND TF (THERMAL FINE) DATA WITH A RESOLUTION OF .56 KM, AND LS (LIGHT SMOOTHED) AND TS (THERMAL SMOOTHED) DATA WITH A RESOLUTION OF 2.8 KM. THERE WERE THREE ONBOARD RECORDERS, AND EACH HAD A STORAGE CAPABILITY OF 400 MIN OF BOTH LS AND TS DATA OR 20 MIN OF LF AND TF DATA. FOR DIRECT READOUT TO TACTICAL SITES, THE EXPERIMENT WAS PROGRAMMED SO THAT LF AND TS DATA WERE OBTAINED AT NIGHT. THE INFRARED DATA (TF AND TS) COVERED A TEMPERATURE RANGE OF 210 TO 310 DEG K WITH AN ACCURACY OF 1 DEG C. THE LS DATA MODE PROVIDED VISUAL DATA THROUGH A DYNAMIC RANGE FROM FULL SUNLIGHT DOWN TO A QUARTER MOON. THIS MODE ALSO AUTOMATICALLY ADJUSTED THE GAIN ALONG SCAN TO ALLOW USEFUL DATA TO BE OBTAINED ACROSS THE TERMINATOR. ADDITIONAL INFORMATION OF THIS EXPERIMENT IS CONTAINED IN THE REPORT, "PRIMARY OPTICAL SUBSYSTEMS FOR DMSP," D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY-AUGUST 1975.

----- DMSP 5D-1/F2, AFGWC STAFF -----

#### INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER SPECIAL SENSOR H (SSH)

NSSDC ID- 77-044A-02

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SVS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

#### PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

#### BRIEF DESCRIPTION

SPECIAL SENSOR H (SSH) WAS A VERTICAL TEMPERATURE PROFILE RADIOMETER (VTPR). THE OBJECTIVE OF THIS EXPERIMENT WAS TO OBTAIN VERTICAL TEMPERATURE, WATER VAPOR, AND OZONE PROFILES OF THE ATMOSPHERE TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE SSH WAS A 16-CHANNEL SENSOR WITH ONE CHANNEL (1022 CM-1) IN THE 10-MICRONEETER OZONE ABSORPTION BAND, ONE CHANNEL (835 CM-1) IN THE 12-MICRONEETER ATMOSPHERIC WINDOW, SIX CHANNELS (747, 725, 708, 695, 676, 668.5 CM-1) IN THE 15-MICRONEETER CO2 ABSORPTION BAND, AND EIGHT CHANNELS (535, 408.5, 441.5, 420, 374, 397.5, 355, 353.5 CM-1) IN THE 22- TO 30-MICRONEETER ROTATIONAL WATER VAPOR ABSORPTION BAND. THE EXPERIMENT CONSISTED OF AN OPTICAL SYSTEM, DETECTOR AND ASSOCIATED ELECTRONICS, AND A SCANNING MIRROR. THE SCANNING MIRROR WAS STEPPED ACROSS THE SATELLITE SUBTRACK, ALLOWING THE SSH TO VIEW 25 SEPARATE COLUMNS OF THE ATMOSPHERE EVERY 32 S OVER A CROSS TRACK GROUND SWATH OF 2000 KM. WHILE THE SCANNING MIRROR WAS STOPPED AT A SCENE STATION, THE CHANNEL FILTERS WERE SEQUENCED THROUGH THE FIELD OF VIEW. THE SURFACE RESOLUTION WAS APPROXIMATELY 39 KM AT NADIR. RADIANCE DATA WERE TRANSFORMED INTO TEMPERATURE, WATER VAPOR, AND OZONE PROFILES BY A MATHEMATICAL INVERSION TECHNIQUE. A MORE COMPLETE DESCRIPTION OF THE EXPERIMENT CAN BE FOUND IN THE REPORT, "DMSP SPECIAL METEOROLOGICAL SENSOR H, OPTICAL SUBSYSTEM," D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, 284-288, JULY-AUGUST 1975.

----- DMSP SD-1/F2: MIZERA -----

INVESTIGATION NAME- REMOTE X-RAY SENSOR - PRECIPITATING ELECTRONS  
NSSDC ID- 77-044A-06 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY

PERSONNEL  
PI - P.F. MIZERA AEROSPACE CORP

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF A LARGE-AREA PROPORTIONAL COUNTER AND FOUR CIRCULAR CADMIUM TELLURIDE (CdTe) SEMICONDUCTORS EMBEDDED IN A HEMISPHERICAL PLASTIC SCINTILLATOR THAT WAS VIEWED BY A PHOTOMULTIPLIER TUBE. THE SEALED PROPORTIONAL COUNTER HAD A COLLIMATOR AND WAS SENSITIVE TO X RAYS FROM 1.5 TO 20.2 KEV. THE CdTe DETECTORS HAD DISCRIMINATORS THAT PROVIDED THRESHOLD VALUES OF 15, 30, 60, AND 90 KEV. THE INVESTIGATION WAS PRIMARILY CONCERNED WITH X RAYS PRODUCED IN THE ATMOSPHERE BY PRECIPITATING ELECTRONS.

----- DMSP SD-1/F2: ROTHWELL -----

INVESTIGATION NAME- PRECIPITATING ELECTRON SPECTROMETER  
NSSDC ID- 77-044A-03 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY

PERSONNEL  
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE SPECTROMETER CONSISTED OF TWO DIFFERENT-SIZED CYLINDRICAL ELECTROSTATIC ANALYZERS (ESAs) USING CHANNELTRON ELECTRON MULTIPLIERS. THE ESA'S POINTED TOWARD THE ZENITH IN ORDER TO MEASURE PRECIPITATING ELECTRONS. THE LARGE ESA HAD A FIELD OF VIEW (FOV) OF 1.6 BY 8.0 DEG WITH A DELTA E/E OF 0.04, WHILE THE SMALL ONE HAD A FOV OF 3.7 BY 4.8 DEG WITH A DELTA E/E OF 0.072. THE LARGE ESA COVERED THE RANGE FROM 1 TO 20 KEV AND THE OTHER ONE FROM 50 TO 1000 EV. A COMPLETE EIGHT-POINT SPECTRUM FROM EACH UNIT WAS OBTAINED IN 1 S.

----- DMSP SD-1/F2: SAGALYN -----

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR  
NSSDC ID- 77-044A-05 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY  
IONOSPHERES

PERSONNEL  
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF ONE SPHERICAL (SEA) AND ONE PLANAR (PEA) ELECTROSTATIC ANALYZER. THE SEA PROVIDED MEASUREMENTS OF ELECTRON DENSITIES FROM 10 TO 1,664/CUBIC CM IN THE TEMPERATURE RANGE FROM 200 TO 15,000 DEG K. THE PEA MEASURED ION TEMPERATURES IN THE SAME RANGE AS WELL AS THE AVERAGE ION MASS OVER THE RANGE 1 TO 35 U. THE PEA WAS ORIENTED IN THE DIRECTION OF THE POSITIVE SPACECRAFT VELOCITY VECTOR, WHILE THE SEA WAS ORIENTED AT RIGHT ANGLES TO THIS DIRECTION AND AWAY FROM THE SUN TO MINIMIZE THE EFFECT OF PHOTOELECTRONS. THE DEVICE ALSO PROVIDED A MEASUREMENT OF THE SPACECRAFT POTENTIAL.

----- DMSP SD-1/F2: SNYDER -----

INVESTIGATION NAME- PASSIVE IONOSPHERIC MONITOR  
NSSDC ID- 77-044A-04 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
IONOSPHERES

PERSONNEL  
PI - A.L. SNYDER USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF A HIGH-FREQUENCY RADIO RECEIVER CONNECTED TO A SHORT ANTENNA THAT SWEEPED FROM 1.3 TO 15.9 MHZ IN 100-KHZ STEPS. THE DEVICE WAS USED TO MONITOR THE IONOSPHERIC BREAKTHROUGH FREQUENCY OF NOISE GENERATED BY HANNADE OR NATURAL SOURCES BELOW THE F2 LAYER TO OBTAIN THE CRITICAL FREQUENCY OF THIS LAYER (F0F2). THE F0F2 PARAMETER WAS USED IN CONSTRUCTING ELECTRON-DENSITY PROFILES USED IN FORECASTING THE STATE OF THE IONOSPHERE. THE INSTRUMENT COULD DETECT ELECTRIC FIELDS DOWN TO 10 MICROVOLTS/M.

----- DMSP SD-1/F3 -----

SPACECRAFT COMMON NAME- DMSP SD-1/F3  
ALTERNATE NAMES- DMSP 14837, DMSP BLOCK SD-3  
DPSPSD-1, DMSP-F3

NSSDC ID- 78-042A

LAUNCH DATE- 05/01/78 WEIGHT- 480. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY  
UNITED STATES USAF-USAFAF

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 05/02/78  
ORBIT PERIOD- 96.89 MIN INCLINATION- 97.6 DEG  
PERIAPSIS- 564. KM ALT APOAPSIS- 653. KM ALT

PERSONNEL  
PI - G.J. SANDS USAF SPACE DIVISION

BRIEF DESCRIPTION  
DMSP SD-1/F3 WAS ONE OF A SERIES OF METEOROLOGICAL SATELLITES DEVELOPED AND OPERATED BY THE AIR FORCE UNDER THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP). THIS PROGRAM, PREVIOUSLY KNOWN AS DAPP (DATA ACQUISITION AND PROCESSING PROGRAM), WAS CLASSIFIED UNTIL MARCH 1973. THE OBJECTIVES OF THIS PROGRAM WERE TO PROVIDE GLOBAL VISUAL AND INFRARED CLOUD COVER DATA AND SPECIALIZED ENVIRONMENTAL DATA TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS. OPERATIONALLY, THE PROGRAM CONSISTED OF TWO SATELLITES IN SUN-SYNCHRONOUS POLAR ORBITS, WITH THE ASCENDING NODE OF ONE SATELLITE IN EARLY MORNING AND THE OTHER AT LOCAL NOON. THE 5.4-M-LONG SPACECRAFT WAS SEPARATED INTO FOUR SECTIONS: (1) A PRECISION MOUNTING PLATFORM (PMF) FOR SENSORS AND EQUIPMENT REQUIRING PRECISE ALIGNMENT, (2) AN EQUIPMENT SUPPORT MODULE (ESM) CONTAINING THE ELECTRONICS, REACTION WHEELS, AND SOME METEOROLOGICAL SENSORS, (3) A REACTION CONTROL EQUIPMENT (RCE) SUPPORT STRUCTURE (THAT HAS THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEM) THAT SUPPORTS (4) A 9.29 SQ M SOLAR CELL PANEL. THE SPACECRAFT STABILIZATION WAS CONTROLLED BY A COMBINATION FLYWHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS COULD BE MAINTAINED IN THE DESIRED 'EARTH-LOOKING' MODE. ONE FEATURE WAS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND AN UPDATED EPHemeris NAVIGATION SYSTEM. THIS ALLOWED AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, WAS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDED REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 1/3-NAUTICAL-MILE RESOLUTION FOR ALL MAJOR LAND MASSES, 1-1/2-NAUTICAL-MILE RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDED WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR H (SSH), A STEP-SCANNING RADIOMETER, WAS THE INFRARED TEMPERATURE-HUMIDITY-OZONE SOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDED THREE HIGH-DENSITY TAPE RECORDERS, WAS CAPABLE OF STORING A TOTAL OF 400 MIN OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA WERE TRANSMITTED TO GROUND-RECEIVING SITES BY TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA WERE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WA, AND LORING AFB, ME, AND RELAYED BY SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA WERE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE SATELLITE CAN BE FOUND IN THE REPORT, 'THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, 4, JULY - AUGUST 1975.

----- DMSP SD-1/F3: AFGWC STAFF -----

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 78-042A-01 INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION  
THE OPERATIONAL LINESCAN SYSTEM (OLS) WAS THE PRIMARY EXPERIMENT ON THE DMSP SD-1/F3 SPACECRAFT. THE PURPOSE OF THIS EXPERIMENT WAS TO PROVIDE GLOBAL, DAY/NIGHT OBSERVATIONS OF CLOUD COVER AND CLOUD TEMPERATURE MEASUREMENTS TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS FOR OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE OLS EMPLOYED A SCANNING OPTICAL TELESCOPE DRIVEN IN AN OSCILLATING MOTION, WITH OPTICAL COMPENSATION FOR IMAGE MOTION, WHICH RESULTED IN NEAR-CONSTANT RESOLUTION THROUGHOUT THE SENSOR FIELD OF VIEW. THE RADIOMETER OPERATES IN TWO ('LIGHT' AND 'THERMAL') SPECTRAL INTERVALS: (1) VISIBLE AND NEAR INFRARED (0.4 TO 1.1 MICRUMETERS) AND (2) INFRARED (8 TO 15 MICRUMETERS). THE RADIOMETER PRODUCED, WITH ONBOARD PROCESSING, DATA IN FOUR MODES -- LF (LIGHT FINE) AND TF (THERMAL FINE) DATA WITH A RESOLUTION OF .56 KM, AND LS (LIGHT SMOOTHED) AND TS (THERMAL SMOOTHED) DATA WITH A RESOLUTION OF 2.8 KM. EACH OF THREE ONBOARD RECORDERS HAD A STORAGE CAPABILITY OF 400 MIN OF BOTH LS AND TS DATA OR 20 MIN

ORIGINAL PAGE IS  
OF POOR QUALITY

OF LF AND TF DATA. FOR DIRECT READOUT TO TACTICAL SITES, THE EXPERIMENT WAS PROGRAMMED SO THAT LF AND TS DATA WERE OBTAINED AT NIGHT. THE INFRARED DATA (TF AND TS) COVERED A TEMPERATURE RANGE OF 210 TO 310 DEG K WITH AN ACCURACY OF 1 DEG C. THE LS DATA MODE PROVIDED VISUAL DATA THROUGH A DYNAMIC RANGE FROM FULL SUNLIGHT DOWN TO A QUARTER MOON. THIS MODE ALSO AUTOMATICALLY ADJUSTS THE GAIN ALONG SCAN TO ALLOW USEFUL DATA TO BE OBTAINED ACROSS THE TERMINATOR. ADDITIONAL INFORMATION ON THIS EXPERIMENT IS CONTAINED IN THE REPORT, 'PRIMARY OPTICAL SUBSYSTEMS FOR DMSP,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1979.

----- DMSP BD-1/F3, AFMWC STAFF-----

INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER  
SPECIAL SENSOR H (SSH)

NSSDC ID- 78-092A-02

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - AFMWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

SPECIAL SENSOR H (SSH) WAS A VERTICAL TEMPERATURE PROFILE RADIOMETER (VTPR). THE OBJECTIVE OF THIS EXPERIMENT WAS TO OBTAIN VERTICAL TEMPERATURE, WATER VAPOR, AND OZONE PROFILES OF THE ATMOSPHERE TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE SSH WAS A 16-CHANNEL SENSOR WITH ONE CHANNEL (1022 CM-1) IN THE 10-MICRO METER OZONE ABSORPTION BAND, ONE CHANNEL (835 CM-1) IN THE 12-MICRO METER ATMOSPHERIC WINDOW, SIX CHANNELS (747, 785, 798, 893, 878, 668.5 CM-1) IN THE 15-MICRO METER CO<sub>2</sub> ABSORPTION BAND, AND EIGHT CHANNELS (335, 408.5, 441.5, 428, 374, 397.5, 395, 333.5 CM-1) IN THE 22- TO 35-MICRO METER ROTATIONAL WATER VAPOR ABSORPTION BAND. THE EXPERIMENT CONSISTED OF AN OPTICAL SYSTEM, DETECTOR AND ASSOCIATED ELECTRONICS, AND A SCANNING MIRROR. THE SCANNING MIRROR WAS STEPPED ACROSS THE SATELLITE SUBTRACK, ALLOWING THE SSH TO VIEW 25 SEPARATE COLUMNS OF THE ATMOSPHERE EVERY 32 S OVER A CROSS TRACK GROUND SWATH OF 2000 KM. WHILE THE SCANNING MIRROR WAS STOPPED AT A SCENE STATION, THE CHANNEL FILTERS WERE SEQUENCED THROUGH THE FIELD OF VIEW. THE SURFACE RESOLUTION WAS APPROXIMATELY 39 KM AT NADIR. THE RADIANCE DATA WERE TRANSFORMED INTO TEMPERATURE, WATER VAPOR AND OZONE PROFILES BY A MATHEMATICAL INVERSION TECHNIQUE. A MORE COMPLETE DESCRIPTION OF THE EXPERIMENT CAN BE FOUND IN THE REPORT, 'DMSP SPECIAL METEOROLOGICAL SENSOR H, OPTICAL SUBSYSTEM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, 284-288, JULY-AUGUST 1979.

----- DMSP BD-1/F3, SHRUM-----

INVESTIGATION NAME- GAMMA-RAY DETECTOR

NSSDC ID- 78-042A-04

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONAUTICS

PERSONNEL

PI - J. SHRUM

USAF TECH APPL CTR

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF A FOUR-DETECTOR ARRAY OF CESIUM IODIDE SCINTILLATORS AND PHOTOMULTIPLIER TUBES EACH SURROUNDED BY A TANTALUM RING SHIELD TO PROVIDE A DIRECTIONAL SYSTEM. EACH DETECTOR WAS POSITIONED SO THAT ITS MOST SENSITIVE DIRECTION FACED 30 DEG FROM THE VERTICAL. PULSE-HEIGHT DISCRIMINATORS WERE USED TO PROVIDE GAMMA-RAY ENERGY LOSS THRESHOLDS OF 0.06, 0.15, AND 0.375 MEV. GAMMA-RAYS PRODUCED IN THE ATMOSPHERE BY COSMIC RAYS, PRECIPITATING ELECTRONS, AND OTHER MEANS CAN BE MONITORED WITH THIS INSTRUMENT.

\*\*\*\*\* DMSP BD-1/F4 \*\*\*\*\*

SPACECRAFT COMMON NAME- DMSP BD-1/F4  
ALTERNATE NAMES- DMSP 15539, DMSP BLOCK BD-1  
DMSPBD1, DMSP-F4

NSSDC ID- 79-050A

LAUNCH DATE- 06/06/79 WEIGHT- 450. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101.4 MIN  
PERIAPSIS- 817. KM ALT

EPOCH DATE- 06/07/79  
INCLINATION- 98.7 DEG  
APOAPSIS- 839. KM ALT

PERSONNEL

PI - G.J. BAROS

USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSP BD-1/F4 IS ONE OF A SERIES OF METEOROLOGICAL SATELLITES DEVELOPED AND OPERATED BY THE AIR FORCE UNDER THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP). THIS PROGRAM, PREVIOUSLY KNOWN AS DAPP (DATA ACQUISITION AND PROCESSING PROGRAM), WAS CLASSIFIED UNTIL MARCH 1975. THE OBJECTIVES OF THIS PROGRAM ARE TO PROVIDE GLOBAL VISUAL AND INFRARED CLOUD COVER DATA AND SPECIALIZED ENVIRONMENTAL DATA TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS. OPERATIONALLY, THE PROGRAM CONSISTS OF TWO SATELLITES IN PLANNED 830-KM SUN-SYNCHRONOUS POLAR ORBITS, WITH THE ASCENDING NODE OF ONE SATELLITE IN EARLY MORNING AND THE OTHER AT LOCAL NOON. THE 5.4-M LONG SPACECRAFT IS SEPARATED INTO FOUR SECTIONS -- (1) A PRECISION MOUNTING PLATFORM (PPR) FOR SENSORS AND EQUIPMENT REQUIRING PRECISE ALIGNMENT, (2) AN EQUIPMENT SUPPORT MODULE (ESM) CONTAINING THE ELECTRONICS, REACTION WHEELS, AND SOME METEOROLOGICAL SENSORS, (3) A REACTION CONTROL EQUIPMENT (RCE) SUPPORT STRUCTURE (THAT HAS THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEM) THAT SUPPORTS (4) A 9.29 SQ M SOLAR CELL PANEL. THE SPACECRAFT STABILIZATION IS CONTROLLED BY A COMBINATION FLYNNHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS ARE MAINTAINED IN THE DESIRED 'EARTH-LOOKING' MODE. ONE FEATURE IS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND AN UPDATED EPHemeris NAVIGATION SYSTEM. THIS ALLOWS AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, IS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDES REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 1/2 NAUTICAL MILE RESOLUTION FOR ALL MAJOR LAND MASSES, 1-1/2 NAUTICAL MILE RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDES WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR H (SSH), A STEP-SCANNING RADIOMETER, IS THE INFRARED TEMPERATURE-HUMIDITY-OZONE SOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDES THREE HIGH-DENSITY TAPE RECORDERS, IS CAPABLE OF STORING A TOTAL OF 480 MIN OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA ARE TRANSMITTED TO GROUND-RECEIVING SITES BY TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA ARE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WA, AND LORING AFB, ME, AND RELAYED BY SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA ARE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE SATELLITE CAN BE FOUND IN THE REPORT, 'THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, 4, JULY - AUGUST 1979.

----- DMSP BD-1/F4, AFMWC STAFF-----

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 79-050A-01

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - AFMWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

THE OPERATIONAL LINESCAN SYSTEM (OLS) IS THE PRIMARY EXPERIMENT ON THE DMSP BD-1/F4 SPACECRAFT. THE PURPOSE OF THIS EXPERIMENT IS TO PROVIDE GLOBAL, DAY/NIGHT OBSERVATIONS OF CLOUD COVER AND CLOUD TEMPERATURE MEASUREMENTS TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS FOR OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE OLS EMPLOYS A SCANNING OPTICAL TELESCOPE DRIVEN IN AN OSCILLATING MOTION, WITH OPTICAL COMPENSATION FOR IMAGE MOTION, WHICH RESULTS IN NEAR-CONSTANT RESOLUTION THROUGHOUT THE SENSOR FIELD OF VIEW. THE RADIOMETER OPERATES IN TWO ('LIGHT' AND 'THERMAL') SPECTRAL INTERVALS -- (1) VISIBLE AND NEAR INFRARED (0.4 TO 1.1 MICRORAMETERS) AND (2) INFRARED (8 TO 13 MICRORAMETERS). THE RADIOMETER PRODUCES, WITH ONBOARD PROCESSING, DATA IN FOUR MODES -- LF (LIGHT FINE) AND TF (THERMAL FINE) DATA WITH A RESOLUTION OF .56 KM AND LS (LIGHT SMOOTHED) AND TS (THERMAL SMOOTHED) DATA WITH A RESOLUTION OF 2.8 KM. EACH OF THREE ONBOARD RECORDERS HAS A STORAGE CAPABILITY OF 400 MIN OF BOTH LS AND TS DATA OR 20 MIN OF LF AND TF DATA. FOR DIRECT READOUT TO TACTICAL SITES, THE EXPERIMENT IS PROGRAMMED SO THAT LF AND TS DATA ARE OBTAINED AT NIGHT. THE INFRARED DATA (TF AND TS) COVER A TEMPERATURE RANGE OF 210 TO 310 DEG K WITH AN ACCURACY OF 1 DEG C. THE LS DATA MODE PROVIDES VISUAL DATA THROUGH A DYNAMIC RANGE FROM FULL SUNLIGHT DOWN TO A QUARTER MOON. THIS MODE ALSO AUTOMATICALLY ADJUSTS THE GAIN ALONG SCAN TO ALLOW USEFUL DATA TO BE OBTAINED ACROSS THE TERMINATOR. ADDITIONAL INFORMATION ON THIS EXPERIMENT IS CONTAINED IN THE REPORT, 'PRIMARY OPTICAL SUBSYSTEMS FOR DMSP,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1979.

----- DMSP BD-1/F4, AFMWC STAFF-----

INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER  
SPECIAL SENSOR H (SSH)

NSSDC ID- 79-050A-02

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

SPECIAL SENSOR H (SSH) IS A VERTICAL TEMPERATURE PROFILE RADIOMETER (VTPR). THE OBJECTIVE OF THIS EXPERIMENT IS TO OBTAIN VERTICAL TEMPERATURE, WATER VAPOR, AND OZONE PROFILES OF THE ATMOSPHERE TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE SSH IS A 16-CHANNEL SENSOR WITH ONE CHANNEL (1822 CM<sup>-1</sup>) IN THE 10-MICRONEPTE OZONE ABSORPTION BAND, ONE CHANNEL (839 CM<sup>-1</sup>) IN THE 12-MICRONEPTE ATMOSPHERIC WINDOW, SIX CHANNELS (747, 785, 708, 695, 676, 668, CM<sup>-1</sup>) IN THE 18-MICRONEPTE CO2 ABSORPTION BAND, AND EIGHT CHANNELS (3355, 408.5, 441.5, 429, 374, 397.5, 358, 353.5 CM<sup>-1</sup>) IN THE 22- TO 30-MICRONEPTE ROTATIONAL WATER VAPOR ABSORPTION BAND. THE EXPERIMENT CONSISTS OF AN OPTICAL SYSTEM, DETECTOR AND ASSOCIATED ELECTRONICS, AND A SCANNING MIRROR. THE SCANNING MIRROR IS STEPPED ACROSS THE SATELLITE SUBTRACK, ALLOWING THE SSH TO VIEW 20 SEPARATE COLUMNS OF THE ATMOSPHERE EVERY 32 S OVER A CROSS TRACK GROUND SWATH OF 2000 KM. WHILE THE SCANNING MIRROR IS STOPPED AT A SCENE STATION, THE CHANNEL FILTERS ARE SEQUENCED THROUGH THE FIELD OF VIEW. THE SURFACE RESOLUTION IS APPROXIMATELY 39 KM AT NADIR. THE RADIANCE DATA ARE TRANSFORMED INTO TEMPERATURE, WATER VAPOR AND OZONE PROFILES BY A MATHEMATICAL INVERSION TECHNIQUE. A MORE COMPLETE DESCRIPTION OF THE EXPERIMENT CAN BE FOUND IN THE REPORT, 'DMSP SPECIAL METEOROLOGICAL SENSOR H, OPTICAL SUBSYSTEM,' D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, 284-288, JULY-AUGUST 1975.

----- DMSP SD-1/F4, AFGWC STAFF-----

INVESTIGATION NAME- SSH/T-MICROWAVE TEMPERATURE SOUNDER

NSSDC ID- 79-050A-06

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
AERONOMY

PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

THE SPECIAL SENSOR MICROWAVE TEMPERATURE SOUNDER IS A SEVEN-CHANNEL SCANNING RADIOMETER WHICH WILL MEASURE RADIATION IN THE 5- TO 6- MM WAVELENGTH (50-60 GHZ) REGION SPECIFICALLY 50.5, 53.2, 54.35, 54.9, 58.4, 58.825, AND 59.4 GHZ TO PROVIDE DATA FOR VERTICAL TEMPERATURES FROM THE EARTH'S SURFACE TO ABOVE 30 KM. IT IS DESIGNED TO SCAN IN SYNCHRONIZATION WITH THE SPECIAL SENSOR H PACKAGE AND WILL PROVIDE TEMPERATURE SOUNDINGS OVER PREVIOUSLY INACCESSIBLE CLOUDY REGIONS AND AT HIGHER ALTITUDES THAN ARE ATTAINABLE FROM THE SSH. THE SSR/T OPERATES IN THE ABSORPTION BAND OF MOLECULAR OXYGEN. BY CHOOSING FREQUENCIES WITH DIFFERENT ABSORPTION COEFFICIENTS ON THE WING OF THE OXYGEN ABSORPTION BAND, A SERIES OF WEIGHTING FUNCTIONS PEAKING AT PRESELECTED ALTITUDES IS OBTAINED. THE RADIOMETER SCANS ACROSS THE NADIR TRACK ON SEVEN SCAN POSITIONS AND TWO CALIBRATION POSITIONS (COLD SKY AND 300 DEG K). THE DWELL TIME FOR THE CROSSTRACK AND CALIBRATION POSITIONS IS 2.7 S EACH. THE TOTAL SCAN PERIOD IS 32 S. THE INSTRUMENT HAS AN INSTANTANEOUS FIELD OF VIEW OF 12 DEG AND SCANS PLUS OR MINUS 36 DEG FROM NADIR.

----- DMSP SD-1/F4, AFGWC STAFF-----

INVESTIGATION NAME- SNOW/CLOUD DISCRIMINATOR SPECIAL SENSOR C (SSC)

NSSDC ID- 79-050A-08

INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - AFGWC STAFF

GLOBAL WEATHER CTR

BRIEF DESCRIPTION

THE SNOW/CLOUD SENSOR IS AN EXPERIMENTAL UNIT THAT IS BEING USED IN CONJUNCTION WITH THE OLS SENSOR ON SPACECRAFT F-4. THE EXPERIMENT BEING PERFORMED BY THE SIMULTANEOUS IN-ORBIT USE OF THESE TWO SENSORS IS PRIMARILY THAT OF PROVING THE PROPOSITION THAT SNOW/CLOUD SCENE DISCRIMINATION CAN BE OBTAINED THROUGH THE COMBINATION OF NEAR IR (1.6 MICRONEPTE WAVE-LENGTH) SENSOR DATA AND OLS L-CHANNEL (VISUAL) INFORMATION. THE SNOW/CLOUD DETECTOR IS A "PUSH-BROOM" SCAN RADIOMETER THAT WILL DEPEND UPON ORBITAL VELOCITY OF THE SD SPACECRAFT TO PROVIDE THE ALONG TRACK SCAN AND A LINEAR ARRAY OF 48 DETECTOR ELEMENTS AT THE IMAGE PLANE OF A WIDE LENS TO PROVIDE A 40.2 DEG CROSS TRACK SCAN. THE SENSOR DEPENDS UPON REFLECTED SOLAR ENERGY IN THE 1.51 TO 1.63 MICRONEPTE SPECTRAL BAND FOR ITS INPUT SIGNAL.

----- DMSP SD-1/F4, HORSE-----

INVESTIGATION NAME- SSD - ATMOSPHERIC DENSITY SENSOR

NSSDC ID- 79-050A-07

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
AERONOMY

PERSONNEL

PI - F.A. HORSE  
OI - D. NICKMAN  
OI - A.D. CHRISTENSEN  
OI - J.B. FRANKE

AEROSPACE CORP  
AEROSPACE CORP  
AEROSPACE CORP  
AEROSPACE CORP

BRIEF DESCRIPTION

THE SSD IS A LIMB-SCANNING ULTRAVIOLET SPECTROMETER WHICH MEASURES DAYGLOW EMISSIONS FROM O AND N2. THE WAVELENGTHS OF PRIMARY INTEREST ARE AT 1356 AND 3371 A. ENERGETIC PHOTOELECTRONS ARE PRODUCED BY PHOTOIONIZATION OF NEUTRAL MOLECULES BY SOLAR EUV RADIATION. AS THESE FAST PHOTOELECTRONS LOSE ENERGY THROUGH COLLISIONS WITH NEUTRALS, THOSE WITH ENERGIES NEAR 16 EV EXCITE O AND N2 TO ELECTRONIC STATES OF ENERGY HIGHER THAN THE GROUND STATE. THE SUBSEQUENT DECAY TO THE GROUND STATE PRODUCES EMISSIONS MONITORED BY THE SSD. THE SSD WILL MEASURE LIGHT EMITTED BY MOLECULAR NITROGEN EXCITATION IN THE LON AND ZO POSITIVE BANDS, AND ATOMIC OXYGEN IN THE 1356 AND 1304 LINES. THE INSTRUMENT ALSO HAD THE CAPABILITY OF PROVIDING SPECTRAL SCANS FROM 850 TO 1200, FROM 1100 TO 1600, AND FROM 2000 TO 3950 A AT 4, 6, AND 12 A RESOLUTION, RESPECTIVELY. LIGHT MONITORED WITH NARROW COLLIMATORS THAT PROVIDES A FIELD-OF-VIEW OF 0.1 DEG X 4 DEG. THE SSD WAS MECHANICALLY DRIVEN TO SCAN VERTICALLY THROUGH THE EARTH'S LIMB FROM 80 TO 480 KM. IT PROVIDED APPROXIMATELY 50 SETS OF DENSITY PROFILES ON THE DAYLIGHT PORTION OF EACH ORBIT.

----- DMSP SD-1/F4, ROTHWELL-----

INVESTIGATION NAME- PRECIPITATING ELECTRON SPECTROMETER

NSSDC ID- 79-050A-03

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
AERONOMY  
PARTICLES AND FIELDS

PERSONNEL

PI - P.L. ROTHWELL

USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE SPECTROMETER CONSISTS OF TWO DIFFERENT-SIZED CYLINDRICAL ELECTROSTATIC ANALYZERS (ESA) USING CHANNELTRON ELECTRON MULTIPLIERS. THE ESA'S POINT TOWARD THE ZENITH IN ORDER TO MEASURE PRECIPITATING ELECTRONS. THE LARGE ESA HAS A FIELD OF VIEW (FOV) OF 1.6 BY 8.0 DEG WITH A DELTA E/E OF 0.04, WHILE THE SMALL ONE HAS A FOV OF 3.7 BY 4.8 DEG WITH A DELTA E/E OF 0.072. THE LARGE ESA COVERS THE RANGE FROM 1 TO 20 KEV AND THE OTHER ONE FROM 50 TO 1800 EV. A COMPLETE EIGHT-POINT SPECTRUM FROM EACH UNIT IS OBTAINED IN 1 S.

----- DMSP SD-1/F4, SAGALYN-----

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR

NSSDC ID- 79-050A-05

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY

PERSONNEL

PI - R.C. SAGALYN

USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF ONE SPHERICAL (SEA) AND ONE PLANAR (PEA) ELECTROSTATIC ANALYZER. THE SEA PROVIDES MEASUREMENTS OF ELECTRON DENSITIES FROM 10 TO 1.66/CUBIC CM IN THE TEMPERATURE RANGE FROM 200 TO 15,000 DEG K. THE PEA MEASURES ION TEMPERATURES IN THE SAME RANGE AS WELL AS THE AVERAGE ION MASS OVER THE RANGE 1 TO 35 U. THE PEA IS ORIENTED IN THE DIRECTION OF THE POSITIVE SPACECRAFT VELOCITY.

----- DMSP SD-1/F4, SNYDER-----

INVESTIGATION NAME- PASSIVE IONOSPHERIC MONITOR

NSSDC ID- 79-050A-04

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING  
INVESTIGATION DISCIPLINE(S)  
IONOSPHERES

PERSONNEL

PI - A.L. SNYDER

USAF GEOPHYS LAB

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTS OF A HIGH-FREQUENCY RADIO RECEIVER CONNECTED TO A SHORT ANTENNA THAT SLEEPS FROM 1.3 TO 19.9 MHZ IN 100-KHZ STEPS. THE DEVICE IS USED TO MONITOR THE IONOSPHERIC BREAKTHROUGH FREQUENCY OF NOISE GENERATED BY MAN-MADE OR NATURAL SOURCES BELOW THE F2 LAYER TO OBTAIN THE CRITICAL FREQUENCY OF THIS LAYER (F0F2). THE F0F2 PARAMETER IS USED IN CONSTRUCTING ELECTRON-DENSITY PROFILES USED IN FORECASTING THE STATE OF THE IONOSPHERE. THE INSTRUMENT CAN DETECT ELECTRIC FIELDS DOWN TO 10 MICROVOLTS/M.

\*\*\*\*\*ESA-GEOS 2\*\*\*\*\*

**SPACECRAFT COMMON NAME-** ESA-GEOS 2  
**ALTERNATE NAMES-** 18981

**NSSDC ID-** 78-071A

**LAUNCH DATE-** 07/16/78                   **WEIGHT-** 273.6 KG  
**LAUNCH SITE-** CAPE CANAVERAL, UNITED STATES  
**LAUNCH VEHICLE-** DELTA

**SPONSORING COUNTRY/AGENCY**  
INTERNATIONAL                           **ESA**

**INITIAL ORBIT PARAMETERS**

**ORBIT TYPE-** GEOCENTRIC  
**ORBIT PERIOD-** 1431.2 MIN  
**PERIAPELUS-** 35619.0 KM ALT

**EPOCH DATE-** 08/06/78  
**INCLINATION-** 0.772 DEG  
**APOEPELUS-** 35774.1 KM ALT

**PERSONNEL**

PI - D.E. RULLINGEN  
PS - K. KNOTT

ESA-ESTEC  
ESA-ESTEC

**BRIEF DESCRIPTION**

ESA-GEOS 2 WAS THE FIRST SPACECRAFT PLACED IN AN EQUATORIAL GEOSTATIONARY ORBIT DEDICATED COMPLETELY TO SCIENTIFIC MEASUREMENTS. THE SPACECRAFT SERVED AS A CORE OR REFERENCE SPACECRAFT FOR THE INTERNATIONAL MAGNETOSPHERIC STUDY (IMS) AND CARRIED OUT CORRELATIVE MEASUREMENTS WITH EXTENSIVE GROUND-BASED NETWORKS IN SCANDINAVIA. THE PAYLOAD CONSISTED OF INSTRUMENTS TO MEASURE: (1) DC AND AC ELECTRIC AND MAGNETIC FIELDS; (2) GRADIENT OF THE MAGNETIC FIELDS; (3) THERMAL AND SUPRATHERMAL PLASMA PARALLEL AND PERPENDICULAR TO THE MAGNETIC FIELDS; (4) ENERGY SPECTRA, ANGULAR DISTRIBUTION, AND COMPOSITION OF POSITIVE IONS; AND (5) ANGULAR DISTRIBUTION AND ENERGY SPECTRA OF ENERGETIC ELECTRONS AND PROTONS. THE SPACECRAFT WAS CYLINDRICAL WITH A HEIGHT OF 1.321 M. THE TOTAL MASS, EXCLUDING PROPELLANTS, WAS 273.6 KG. THERE WERE FOUR TELESCOPIC AXIAL BOOMS 2.5 M IN LENGTH FOR THE MESHED WIRE SPHERES OF AN AC ELECTRIC FIELD EXPERIMENT, TWO 20-M CABLE BOOMS FOR MAGNETIC AND ELECTRIC FIELD SENSORS, AND FOR AN EXCITATION ANTENNA FOR PLASMA RESONANCES, AND TWO LOCKING RADIAL BOOMS 3 M IN LENGTH FOR A VARIETY OF INSTRUMENTS. THERE WERE SIX HYDRAZINE THRUSTERS, TWO TO TILT AND PRECESS THE SPACECRAFT, TWO TO MODIFY THE ORBIT SO THE LONGITUDE OF THE APODEE COULD BE CHANGED, AND TWO FOR SPIN UP AND SPIN DOWN. THE SPIN RATE WAS NOMINALLY 10 RPM. DATA WERE TELEMETERED IN REAL TIME AT 137.2 MHZ (106 AND 744 BPS) AND AT 2207.5 MHZ (11.91 OR 95.25 KBS). ATTITUDE MEASUREMENTS WERE OBTAINED BY A SUN SENSOR, A DUAL INFRARED EARTH SENSOR, AND ACCELEROMETERS. POWER WAS SUPPLIED BY 7200 SOLAR CELLS MOUNTED ON THE SPACECRAFT SURFACE. TO PREVENT SPACECRAFT DIFFERENTIAL CHARGING, 96 PERCENT OF THE SURFACE WAS ELECTRICALLY CONDUCTIVE. BECAUSE OF THE IMPORTANCE OF THE MAGNETIC FIELD MEASUREMENTS, THE SPACECRAFT RESIDUAL FIELD AT THE MAGNETOMETER IS ONLY 0.3 NT (GAMMAS). EXCEPT FOR MINOR MODIFICATIONS TO CERTAIN EXPERIMENTS, THIS SPACECRAFT AND INSTRUMENTS WERE IDENTICAL TO ESA-GEOS 1 (77-029A) AND MORE DETAILED INFORMATION CAN BE FOUND IN 'ESA BULLETIN' NO. 9 MAY 1977. ONE SOLAR PANEL DEVELOPED A SHORT CIRCUIT SOON AFTER LAUNCH AND A NUMBER OF THE EXPERIMENTS COULD OBTAIN USEFUL DATA ONLY FOR ONE HALF OF THE SPIN PERIOD.

\*\*\*\*\*ESA-GEOS 2, BEGHIN\*\*\*\*\*

**INVESTIGATION NAME-** WAVE FIELD IMPEDANCE

**NSSDC ID-** 78-071A-11                   **INVESTIGATIVE PROGRAM**  
**SCIENCE**

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**  
PI - C. BEGHIN

CNRS, CTR FOR SPECTROM

**BRIEF DESCRIPTION**

THIS INVESTIGATION WAS PART OF ESA EXPERIMENT NO. 5-300 AND MADE USE OF ONE SET OF MESHED ELECTRIC SPHERES MOUNTED ON THE END OF THE AXIAL BOOMS (PART OF 78-071A-10, UNISTRUP) AND THE TWO VITREOUS CARBON SPHERES MOUNTED ON THE END OF THE 20-M RADIAL BOOMS (78-071A-07, PEDERSEN). THE MESHED SPHERES WERE USED AS TRANSMITTING ELEMENTS FOR FREQUENCIES FROM 0.2 TO 76 MHZ. THE SELF-IMPEDANCE OF THESE SPHERES AND THE MUTUAL IMPEDANCE BETWEEN THE MESHED AND LONG-BOOM CARBON SPHERES WERE MEASURED. STRONG RESONANCES AT THE HYBRID RESONANCE FREQUENCIES AND ANTI-RESONANCES AT THE GYRO FREQUENCIES WERE USED TO DETERMINE THE DENSITY OF THE SURROUNDING PLASMA. FREQUENCIES UP TO 450 MHZ WERE TELEMETERED DIRECTLY, AND SWEEP-FREQUENCY ANALYZERS AND A DIGITAL CORRELATOR WERE EMPLOYED TO OBTAIN THE AUTO- AND/CROSS-CORRELATION UP TO 77

MHZ WITH SELECTABLE BANDWIDTHS OF 2.5, 5.0, OR 10.0 MHZ.

\*\*\*\*\*ESA-GEOS 2, GEISS\*\*\*\*\*

**INVESTIGATION NAME-** LOW-ENERGY ION COMPOSITION

**NSSDC ID-** 78-071A-03                   **INVESTIGATIVE PROGRAM**  
**SCIENCE**

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS

**PERSONNEL**

PI - J. GEISS  
PI - H.R. ROSENBAUER  
OI - P.K. EBENHART  
OI - H. DAESIGER  
OI - A. GHIELMETTI  
OI - H. LOIDL  
OI - D.T. YOUNG

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MPI-AERONOMY  
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**BRIEF DESCRIPTION**

THIS INSTRUMENT (ESA EXPERIMENT NO. 5-303) MEASURED THE ENERGY, ANGULAR DISTRIBUTION, AND COMPOSITION OF POSITIVE IONS USING A CYLINDRICAL ELECTROSTATIC ANALYZER (ESA) FOLLOWED BY A CROSSED ELECTRIC AND MAGNETIC FIELD ANALYZER (CFA) TO SELECT THE ENERGY AND VELOCITY. THE ENERGY (PER UNIT CHARGE) RANGED FROM 0.001 TO 17.7 KEV IN 32 STEPS WITH A DELTA E/E OF 0.03 AND A MASS RANGE OF 1 TO 149 U IN 64 LOGARITHMICALLY SPACED STEPS. THERE WAS A THERMAL PODE IN WHICH A RETARDING GRID IN THE ENTRANCE SLIT WAS USED FOR ANALYSIS BELOW 0.1 KEV. ALL PARTICLES THAT OVERCAME THIS GRID VOLTAGE WERE ACCELERATED TO 3 KEV BEFORE ENTERING THE ESA IN ITS LOWEST ENERGY STEP, WHERE BOTH THE ESA AND CFA WERE TRANSPARENT. THE DEVICE VIEWS PERPENDICULAR TO THE SPIN OR Z AXIS, FOR LOW-ENERGY IONS. THE ACCEPTANCE ANGLES WERE PLUS OR MINUS 6 DEG IN AZIMUTH AND PLUS OR MINUS 30 DEG IN ELEVATION (REFERENCED TO THE Z AXIS). FOR THE HIGHEST ENERGIES, THESE ANGLES DECREASED TO 3.5 AND 7.1 DEG, RESPECTIVELY. THREE PERCENT OF THE IONS LEAVING THE ESA WERE COUNTED BY A CHANNELTRON. THE REMAINING 97 PERCENT ENTERED THE CFA AND THE OUTPUT WAS DETECTED BY AN ELECTRON MULTIPLIER. THIS SIGNAL WAS PULSE-HEIGHT ANALYZED BY ONE FIXED AND ONE VARIABLE DISCRIMINATOR TO OBTAIN BETTER MASS DISCRIMINATION. THE MAIN PURPOSE OF THIS INVESTIGATION WAS TO IDENTIFY THE SOURCES OF LOW-ENERGY PARTICLES IN THE MAGNETOSPHERE, TIME VARIATIONS OF THE HELIUM/HYDROGEN RATIO, THE DEGREE OF IONIZATION OF HELIUM AND OXYGEN, AND THE ISOTOPIC ABUNDANCE RATIO OF HELIUM 3/HELIUM 4 COULD BE MEASURED TO DETERMINE THESE SOURCES.

\*\*\*\*\*ESA-GEOS 2, GENDRIN\*\*\*\*\*

**INVESTIGATION NAME-** MAGNETIC WAVE FIELDS

**NSSDC ID-** 78-071A-06                   **INVESTIGATIVE PROGRAM**

**SCIENCE**  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - R.E. GENDRIN  
OI - J.M. ETCHETO  
OI - E. UNGSTRUP

CNET  
CNET  
DANISH SPACE RES INST

**BRIEF DESCRIPTION**

THE INSTRUMENT USED TWO SETS OF THREE-AXIS SEARCH COIL MAGNETOTREMES, ONE FOR THE ULF/VLF RANGE (0.1 TO 450 Hz) AND ONE FOR THE VLF RANGE (0.3 TO 30 kHz). EACH SEARCH COIL CONSISTED OF A HIGH-PERMEABILITY MATERIAL WITH A HIGH DENSITY PICK-UP WINDING. EACH SET OF THE THREE COILS WAS BUILT INTO A SINGLE ASSEMBLY AND MOUNTED ON THE LOCKING 3-M ROOMS AT A DISTANCE OF 2 M FROM THE SPACECRAFT. TYPICAL SENSITIVITIES OF THESE SENSORS IN UNITS OF GAMMAS PER SQ ROOT OF Hz, WERE 1.E-1 AT 0.1 Hz, 2.E-4 AT 10 Hz, AND ABOUT 3.E-6 AT 1 kHz. THESE SENSORS AND SOME ASSOCIATED ELECTRONICS CONSISTING OF (1) A LARGE NUMBER OF CHANNEL-SELECTION SWITCHES, (2) A NUMBER OF BANDPASS FILTERS, (3) SIX SWEEP-FREQUENCY ANALYZERS (SFA), (4) A DIGITAL CORRELATOR, AND (5) EIGHT STEPPED-GAIN AMPLIFIERS, WERE A PART OF THE ESA WAVE EXPERIMENT NO. 5-300. THESE COMPONENTS WERE EMPLOYED FOR THE SENSORS DESCRIBED IN 78-071A-07 (PEDERSEN) AND -10 (UNGSTRUP), AND ALSO THE INVESTIGATIONS DESCRIBED IN -05 (ETCHETO) AND -11 (BEGHIN). SIX ANALOG CHANNELS OF 450 Hz BANDWIDTH AND THE DIGITAL CORRELATOR OUTPUT WERE TRANSMITTED BY THE 95.25 KBS TELEMETRY MODE. THE SFAS COVERED THE FREQUENCY RANGE UP TO 77 kHz IN 256 PARTLY OVERLAPPING STEPS. THE CORRELATOR PROVIDED AN AUTO-CORRELOGRAM OF 128 POINTS WITHIN 20 MS. ITS BANDWIDTH COULD BE SELECTED TO BE 2.5, 5.0, OR 10.0 kHz. CROSS-CORRELOGRAM BETWEEN TWO SENSORS COULD BE PROVIDED. THE CORRELATOR ALSO OPERATED IN A TIME-SHARING MODE BETWEEN AUTO- AND CROSS-CORRELATION.

\*\*\*\*\*ESA-GEOS 2, MULTIVIST\*\*\*\*\*

**INVESTIGATION NAME-** LOW-ENERGY ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 78-071A-04

INVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

## PERSONNEL

PI - D.K.G. HULTQUIST  
OI - H. BORG  
OI - L.A. HOLMGRENKIRUNA GEOPHYS INST  
KIRUNA GEOPHYS INST  
KIRUNA GEOPHYS INSTMPI-EXTRATERR PHYS  
MPI-NUCLEAR PHYS  
MPI-EXTRATERR PHYS

## BRIEF DESCRIPTION

THIS INSTRUMENT (ESA EXPERIMENT NO. S-310) MEASURED THE ENERGY AND PITCH ANGLE DISTRIBUTION OF ELECTRONS AND PROTONS IN THE ENERGY RANGE 0.2 TO 20 KEV WITH EXTENSIVE ANGULAR COVERAGE CONCENTRATED IN THE LOSS CONE REGION. THE PURPOSE OF THE INVESTIGATION WAS TO IMPROVE THE UNDERSTANDING OF AURORAL PARTICLE ACCELERATION AND PRECIPITATION MECHANISMS BY COMPARING NEAR-EQUATORIAL PARTICLE DISTRIBUTIONS WITH COORDINATED GROUND-BASED OBSERVATIONS AT THE FOOT OF THE MAGNETIC FIELD LINE. HIGH TEMPORAL AND SPATIAL RESOLUTION OF THE INSTRUMENT WAS PROVIDED TO STUDY WAVE-PARTICLE INTERACTIONS. THE EXPERIMENT OF WILKIN (78-071A-03) WAS COMPLEMENTARY TO THIS ONE, EXTENDING TO HIGH ENERGY RANGES BOTH ELECTRON AND PROTON OBSERVATIONS. A TOTAL OF 12 CURVED-PLATE ANALYZERS WITH CHANNEL ELECTRON MULTIPLIERS FOR PARTICLE DETECTION WERE USED. ALTHOUGH NORMALLY EIGHT ANALYZERS WERE USED TO DETECT ELECTRONS AND TWO TO DETECT PROTONS, A COMPLEX ARRANGEMENT WITH FOUR SEPARATE HV SUPPLIES ALLOWED INDEPENDENT SWITCHING OF FOUR DETECTOR GROUPS. THE ANALYZING PLATE VOLTAGES COULD OPERATE IN A STEPPING MODE, A SWEEPING MODE, OR A CONSTANT-VOLTAGE MODE. IN ADDITION, THE TIME ACCUMULATION COULD BE VARIED WITH A NOMINAL FRAME DURATION OF 43 MS. HOWEVER, THIS OPERATION COULD BE DECREASED BY A FACTOR OF FOUR AT THE EXPENSE OF OBTAINING DATA FROM CERTAIN DETECTORS IN THOSE CASES WHERE FAST TEMPORAL VARIATIONS WERE ENCOUNTERED IN THE LOSS CONE. THE ENERGY INTERVALS IN THE STEPPING MODE CONSISTED OF 32 ENERGY STEPS. THE EIGHT NORMAL ELECTRON ANALYZERS, WITH GEOMETRIC FACTOR ( $\Omega$ ) OF 3.6- $\times$  80 CM $\times$ SR, CONSISTED OF FOUR NARROW-ANGLE (2 DEG  $\times$  2 DEG, DELTA E/E OF 0.11) AND FOUR WIDE-ANGLE (6 DEG  $\times$  7.5 DEG, DELTA E/E OF 0.09) DEVICES. THE TWO NORMAL PROTON ANALYZERS HAD DELTA E/E OF 0.13, APERTURE OF 6 DEG  $\times$  3 DEG, AND  $\Omega$  OF 1.6- $\times$  80 CM $\times$ SR. APERTURE ANGULAR WIDTHS REFER TO ELEVATION AND AZIMUTH, RESPECTIVELY, IN RELATION TO THE SPACECRAFT SPIN AXIS. THIS EXPERIMENT RELIED HEAVILY ON REAL-TIME GROUND COMPUTER CONTROL.

-----ESA-GEOS 2, MARIANI-----

## INVESTIGATION NAME- TRIAXIAL FLUONGATE MAGNETOMETER

NSSDC ID- 78-071A-09 INVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

## PERSONNEL

PI - F. MARIANI  
OI - M. CANDIDI  
OI - D.M. FAIRFIELDU OF ROMA  
CNR, SPACE PLASMA LAB  
NASA-GSFCINVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
MAGNETOSPHERIC PHYSICS

## BRIEF DESCRIPTION

A TRIAXIAL FLUONGATE MAGNETOMETER WAS EMPLOYED FOR SIMULTANEOUS MEASUREMENTS OF THE THREE COMPONENTS OF THE MAGNETIC FIELD. THE FREQUENCY RANGE COVERED BY THE INSTRUMENT EXTENDED FROM DC UP TO 5 Hz. IN THE NORMAL ORIENTATION OF THE SATELLITE THE MAIN COMPONENT OF THE FIELD COINCIDED WITH THE Z-AXIS OF THE INSTRUMENT, WHICH WAS ALIGNED WITH THE SPIN AXIS OF THE SATELLITE. THE EXPERIMENT HAD BEEN DESIGNED WITH TWO SENSITIVITY RANGES FOR THE X AND Y COMPONENTS FOR WHICH THE MAGNETIC FIELD COMPONENT WAS ONLY A FRACTION OF THE TOTAL FIELD AND WAS MODULATED BY THE ROTATION OF THE SPACECRAFT. THIS LAST FEATURE MADE THE RANGE SWITCH TECHNIQUE PREFERABLE TO A BIAS OFFSET TECHNIQUE. THE TWO SELECTED SENSITIVITY RANGES WERE PLUS OR MINUS 60 NT (GAMMAS) AND PLUS OR MINUS 180 NT, RESPECTIVELY. IN Z-AXIS, WHERE THE FIELD WAS HIGHER AND NOT MODULATED BY THE SATELLITE ROTATION, A SINGLE SENSITIVITY RANGE OF PLUS OR MINUS 60 NT WAS USED. THE SIGNAL WAS KEPT WITHIN RANGE BY SUPERIMPOSING POSITIVE AND NEGATIVE BIAS LEVELS OF 60 NT EACH, SUCH THAT A RANGE PLUS OR MINUS 120 NT WITH A CONSTANT QUANTIZATION ERROR OF PLUS OR MINUS 0.125 NT USING A 9-BIT DIGITIZATION WAS OBTAINED. THE NOISE LEVEL OF THE SENSORS WAS COMPARABLE TO THIS QUANTIZATION ERROR.

-----ESA-GEOS 2, MELZNER-----

INVESTIGATION NAME- DC ELECTRIC FIELD AND GRADIENT B  
ELECTRON BEAM DEFLECTIONNSSDC ID- 78-071A-08 INVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

## PERSONNEL

PI - F. MELZNER  
OI - H. VOLK  
OI - G. RETZNER

## BRIEF DESCRIPTION

THE PRIME OBJECTIVE OF THIS INVESTIGATION (ESA EXPERIMENT NO. S-329) WAS THE MEASUREMENT OF THE DC ELECTRIC FIELD IN THE PLANE PERPENDICULAR TO THE LOCAL MAGNETIC FIELD (B). THE INVESTIGATION ALSO MEASURED THE SPATIAL GRADIENT OF B IN THE VICINITY OF THE SPACECRAFT. WITH THESE DATA, A MAPPING OF THE ELECTRIC FIELDS IN THE EQUATORIAL MAGNETOSPHERE LINKED MAGNETICALLY TO THE AURORAL ZONES COULD BE ACHIEVED, AS WELL AS DETERMINING PLASMA CONVECTION AND PARTICLE FLOW WITHIN THE PLASMA SHEET. THE INSTRUMENT CONSISTED OF FOUR ELECTRON GUNS SPACED LOGARITHMICALLY FROM THE ELECTRON DETECTOR. TWO OF THE GUNS WERE MOUNTED ON ONE OF THE 3-M RADIAL BOOMS. THE GUNS WERE USED ONE AT A TIME TO GENERATE AN ELECTRON BEAM OF ABOUT 1.6- $\times$  AMP AND ENERGY ABOUT 1 KEV. BOTH PARAMETERS WERE VARIED BY TELECOMMAND. DEFLECTION PLATES ASSOCIATED WITH EACH GUN RECEIVED A SINUSOIDAL SIGNAL FROM THE MAGNETOMETER INVESTIGATION TO INSURE THAT THE BEAM WAS ALWAYS AT RIGHT ANGLES TO B. IN SPITE OF THE ANGLE OF THE SPIN VECTOR TO B, THE ELECTRON DETECTOR CONSISTED OF DEFLECTION PLATES THAT REMOVED THE ELEVATION CORRECTION GIVEN TO THE BEAM BY THE MAGNETOMETER SIGNAL, A CURVED PLATE ENERGY FILTER, AND A PHOTOMULTIPLIER TUBE. BECAUSE THE MAXIMUM DISPLACEMENT OCCURRED WHEN THE BEAM MADE AN ANGLE OF 0 OR 180 DEG TO THE ELECTRIC FIELD, ALL POSSIBLE DISPLACEMENTS LESS THAN THIS OCCURRED TWICE DURING A SPIN PERIOD. CONSEQUENTLY, THE BEAM SWEEP ACROSS THE DETECTOR TWICE PER SPIN PERIOD, PROVIDED THE MAXIMUM DISPLACEMENT WAS LESS THAN THE DISTANCE BETWEEN THE GUN AND THE DETECTOR. THE VALUES OF THE SPIN ANGLE AT WHICH THE BEAM WAS DETECTED AFTER ONE SPINATION, AND THE DISTANCE BETWEEN THE GUN AND RECEIVER, ALLOWED THE DETERMINATION OF THE ELECTRIC FIELD. A POSSIBLE CONTRIBUTION FROM THE GRADIENT OF B COULD BE DETERMINED BY VARYING THE ENERGY OF THE BEAM. THE INVESTIGATION RELIED ENTIRELY ON REAL-TIME CONTROL BY A GROUND-BASED COMPUTER. IT HAS FOUR BASIC MODES OF OPERATIONS: SEARCH, ADJUSTMENT, OPTIMIZATION, AND NORMAL. THE SEARCH MODE WAS DESIGNED TO FIND THE SIGNAL AT NOMINAL BEAM PARAMETERS. IF THIS WAS NOT ACHIEVED, THE ADJUSTMENT MODE WAS USED TO VARY THESE PARAMETERS SYSTEMATICALLY. ONCE THE BEAM WAS DETECTED, THE OPTIMIZATION MODE DETERMINED THE BEST COMPROMISE BETWEEN BEAM CURRENT AND RECEIVED SIGNAL QUALITY. THEN THE NORMAL MODE STARTED, WHICH CONSISTED OF A CONTINUOUS MEASUREMENT OF THE ELECTRIC FIELD AND THE GRADIENT OF B, USING THE MOST APPROPRIATE OF THE FOUR GUNS.

-----ESA-GEOS 2, PEDERSEN-----

## INVESTIGATION NAME- DC FIELDS BY DOUBLE PROBE

NSSDC ID- 78-071A-07

INVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
MAGNETOSPHERIC PHYSICS

## PERSONNEL

PI - A. PEDERSEN  
OI - D. JONES  
OI - K. KNOTT  
OI - R.J.L.GRAD

## BRIEF DESCRIPTION

THIS INSTRUMENT CONSISTED OF TWO VITREOUS CARBON SPHERES MOUNTED AT THE TIPS OF THE 20-M CABLE BOOMS, WHICH EXTENDED RADIALLY FROM THE SPACECRAFT PERPENDICULAR TO THE SPIN AXIS AND COMPRISED PART OF THE ESA NO. S-300 WAVE EXPERIMENT. THIS INVESTIGATION WAS CONCERNED WITH THE DC SINGLE-AXIS ELECTRIC FIELD ANALYSIS. THE TWO OUTPUT SIGNALS WERE EVALUATED IN TERMS OF DC ELECTRIC FIELD AND CONDITIONED FOR FURTHER TREATMENT IN THE ANALYSIS OF AC ELECTRIC FIELDS. THE OUTPUT FROM ONE SPHERE WAS SIGNAL CONDITIONED ON A LINEAR SCALE; THE DIFFERENTIAL OUTPUT FROM THE TWO SPHERES WAS COMPRESSED LOGARITHMICALLY. IN ADDITION, THE TWO OUTPUTS WERE PASSED THROUGH 450 Hz TO 77 kHz FILTERS. THESE FILTERED SIGNALS WERE DIFFERENCE AND ALL THREE SIGNALS MADE AVAILABLE FOR ANALYSIS BY THE SWEPT-FREQUENCY ANALYZERS AND DIGITAL CORRELATOR AS PART OF 78-071A-05 (PETIT), -10 (UNGSTRUP), AND -01 (BEGHIN) INVESTIGATIONS. THE SENSITIVITY OF THIS PROBE WAS ABOUT 1.6- $\times$  V/M AT DC AND 1.6- $\times$  V/M TIMES THE SQUARE ROOT OF Hz.

-----ESA-GEOS 2, PETIT-----

## INVESTIGATION NAME- ULF PLASMA RESONANCES

NSSDC ID- 78-071A-05

INVESTIGATIVE PROGRAM  
SCIENCEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICSPERSONNEL  
PI - M. PETIT

CNET

ORIGINAL PAGE IS  
OF POOR QUALITY

**BRIEF DESCRIPTION**

THIS INVESTIGATION (PART OF ESA EXPERIMENT NO. S-300) UTILIZED THE 20-M BOOMS (NORMAL TO THE SPACECRAFT SPIN AXIS) AS A DIPOLE ANTENNA, AND THE CARBON SPHERES (PART OF 70-071A-07, PROVIDED) AS THE RECEIVING ELEMENT. FREQUENCIES FROM 0.5 TO 77 KHZ WERE EMPLOYED. ON TRANSMISSION OF A VLF SIGNAL OF LIMITED DURATION, A TRANSIENT SIGNAL WAS OBSERVED FOR A MUCH LONGER PERIOD THAN THE PULSE LENGTH, PROVIDING THE SPECTRUM OF THE TRANSMITTED SIGNAL INCLUDED ONE OF THE RESONANCE FREQUENCIES OF THE PLASMA. THE AMBIENT PLASMA DENSITY WAS INFERRED FROM THE DETERMINATION OF THE RESONANT FREQUENCIES. RECEIVED FREQUENCIES UP TO 400 Hz WERE TELEMETRED DIRECTLY, AND SIX SWEEP-FREQUENCY ANALYZERS AND A DIGITAL CORRELATOR PROVIDED AUTO- AND CROSS-CORRELATIONS UP TO 77 KHZ. BANDWIDTHS OF 2.0, 5.0, 9.0, OR 10.0 KHZ COULD BE SELECTED FOR THE CORRELATOR.

**----- EEA-600 2, WREN****INVESTIGATION NAME- ELECTRIC FIELD**

NSSDC ID- 70-071A-10 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - E. WREN

DANISH SPACE RES INST

**BRIEF DESCRIPTION**

THIS INVESTIGATION WAS PART OF THE EEA NO. S-300 FIELD EXPERIMENT AND EMPLOYED THE FOUR MESH SPHERES MOUNTED AT THE END OF THE 2.0-M AXIAL BOOMS. DIFFERENTIAL MEASUREMENTS FROM THESE SENSORS PROVIDED THE THREE VECTOR COMPONENTS OF THE ELECTRIC FIELD. FREQUENCIES FROM 50 Hz TO 77 kHz WERE ANALYZED WITH THE SWEEP-FREQUENCY ANALYZER AND THE DIGITAL CORRELATOR. FREQUENCIES UP TO 400 Hz WERE TELEMETRED DIRECTLY, AND AUTO- AND/OR CROSS-CORRELATION OF THE SENSOR OUTPUTS UP TO 77 kHz WERE ACCOMPLISHED WITH SELECTABLE BANDWIDTHS OF 2.0, 5.0, 9.0, 10.0 kHz. THE SENSITIVITY OF THE MESH SPHERE PRObes AT 10 kHz WAS 1.0E-6 V/M TIMES THE SQUARE ROOT OF Hz.

**----- EEA-600 2, WILKEN****INVESTIGATION NAME- ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION**

NSSDC ID- 70-071A-01 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - B. WILKEN  
OI - G. PFOTZER (RETIRED)  
OI - E. KEPPLER  
OI - A. KORTH  
OI - J. MUENCH

MPJ-AERONAUTY  
MPJ-AERONAUTY  
MPJ-AERONAUTY  
MPJ-AERONAUTY  
MPJ-AERONAUTY

**BRIEF DESCRIPTION**

THIS INSTRUMENT (ESA EXPERIMENT NO. S-321) MEASURED THE ENERGY AND PITCH ANGLE DISTRIBUTION OF HIGHER ENERGY ELECTRONS AND PROTONS THAN THAT OF MULTIVISIT (70-071A-04), AND WAS COMPLEMENTARY TO THAT INSTRUMENT. THE DETECTOR SYSTEM CONSISTED OF TWO SEPARATE MAGNETIC SPECTROMETERS FOR ELECTRONS WITH TWO PHOTON TELESCOPES ASSOCIATED WITH EACH OF THE MAGNETS THAT FOCUSED THE ELECTRONS AWAY FROM THE PHOTON DETECTORS. THERE WERE FIVE RECTANGULAR SOLID-STATE DETECTORS MOUNTED ALONG THE FOCAL LINE OF EACH SPECTROMETER TO MEASURE THE ELECTRONS. EACH SPECTROMETER COVERED AN ANGULAR APERTURE IN ELEVATION ANGLE (RELATIVE TO THE SPIN AXIS) OF 60 DEG. THE TWO DEFLECTION MAGNETS WERE POSITIONED SO THAT ELEVATION ANGLES (REFERRED TO THE SPIN AXIS) FROM 10 TO 120 DEG, ON 10 DEG CENTERS, WERE COVERED FOR ELECTRONS, GIVING ELEVATION ANGLES OF 25, 45, 65, AND 105 DEG FOR THE PHOTON TELESCOPES. THESE TELESCOPES CONSISTED OF A FRONT, SURFACE-BARRIER DETECTOR AND A REAR, SOLID-STATE DETECTOR. ELECTRON ENERGIES FROM 30 TO 200 KEV AND PROTON ENERGIES FROM 0.05 TO 1.0 MEV WERE COVERED. THE EFFECTIVE ANGULAR APERTURE FOR PROTONS WAS 10 DEG X 6 DEG (ELEVATION X AZIMUTH) AND FOR ELECTRONS WAS 6 DEG X 6 DEG. GEOMETRIC FACTORS IN UNITS OF 1.0E-10 CM-SR WERE FIVE FOR PROTONS AND ONE FOR ELECTRONS. A 12-CHANNEL PULSE-HEIGHT ANALYZER (PHA) FOR PROTONS COULD BE USED FOR ANY ONE OF THE FOUR FRONT DETECTORS, PROVIDED A FRONT-REAR COINCIDENCE IS DETECTED, AND A 15-CHANNEL PHA CAN BE USED FOR ANY ONE OF THE 10 ELECTRON DETECTORS. THE SINGLES RATE FOR ONE OF THE FOUR PROTON DETECTORS AND THE COINCIDENCE RATE FROM ONE OF THE FOUR PHOTON TELESCOPES COULD BE SELECTED. THERE WERE THREE MODES FOR DATA SELECTION -- MODE 0, INTEGRAL COUNT RATES AND SPECTRAL MEASUREMENTS FOR ALL 14 DETECTORS; MODE 1, INTEGRAL COUNT RATES AND SPECTRAL MEASUREMENTS FOR FOUR DETECTORS - GOOD TIME RESOLUTION OF INTEGRAL RATES; AND MODE 2, INTEGRAL COUNT RATES AND SPECTRAL MEASUREMENTS - GOOD TIME RESOLUTION FOR ENERGY SPECTRA. THE MINIMUM TIME FOR A COMPLETE SPECTRUM WAS 600 MS; THE MINIMUM TIME FOR INTEGRAL RATE VARIATIONS WAS 45 MS. THE SPECTRAL MEASUREMENTS HAD A RESOLUTION OF DELTA E/E = 0.20.

**----- EEA-600 2, WREN****INVESTIGATION NAME- THERMAL PLASMA FLOW**

NSSDC ID- 70-071A-02

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - G.L. WREN  
OI - G.L.F. BOYD  
OI - R. NORMAN  
OI - W.J. RAITT

U COLLEGE LONDON  
U COLLEGE LONDON  
U COLLEGE LONDON  
UTAH STATE U

**BRIEF DESCRIPTION**

THE INSTRUMENT (EEA EXPERIMENT NO. S-302) EMPLOYED TWO HEMISPHERICAL ELECTROSTATIC ANALYZERS MOUNTED ON ONE OF THE LOCKING BOOMS FOR THE MEASUREMENT OF ELECTRONS OR PROTONS OVER THE RANGE 0.5 TO 300 EV ARRIVING CLOSE TO PARALLEL AND CLOSE TO PERPENDICULAR TO THE LOCAL MAGNETIC FIELD. THE ENERGY RANGE WAS COVERED IN 64 STEPS WITH A RELATIVE ENERGY RESOLUTION OF 0.11. ONE ANALYZER HAD ITS APERTURE POINTING ALONG THE NEGATIVE (+) SPIN AXIS WITH AN OPENING ANGLE OF 10 DEG X 10 DEG PROVIDING A GEOMETRICAL FACTOR (G) OF 6.0E-4 SQ CM-SR. THE OTHER ANALYZER MADE AN ANGLE OF 100 DEG WITH RESPECT TO THE +Z AXIS WITH AN OPENING ANGLE OF 8 DEG X 30 DEG PROVIDING A G OF 0.2E-4 SQ CM-SR. BOTH DETECTORS HAD TO MEASURE THE SAME TYPE OF PARTICLES AT THE SAME TIME. THE COLLIMATORS OF THESE INSTRUMENTS COULD BE SET AT ANY VOLTAGE FROM -20 TO +20 V IN STEPS OF 0.1 V TO COMPENSATE FOR THE POTENTIAL DIFFERENCE BETWEEN THE INSTRUMENT AND THE UNDISTURBED PLASMA ENVIRONMENT. THIS VOLTAGE DETERMINED THE SPACECRAFT POTENTIAL.

oooooooooooooo GEOS 3ooooooo

**SPACECRAFT COMMON NAME- GEOS 3****ALTERNATE NAMES- GEODETIC SATELLITE-C, GEOS-C**

NSSDC ID- 70-0274

LAUNCH DATE- 04/09/75  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

WEIGHT- 300. 46

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSTA

INITIAL CRIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101.82 MIN  
PERIAPSIS- 839. KM ALT

EPOCH DATE- 04/10/75  
INCLINATION- 114.96 DEG  
APOAPSIS- 833. KM ALT

**PERSONNEL**

PI - C.J. FINLEY  
SC - J.P. MURPHY  
PB - H.R. STANLEY

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-HFC

**BRIEF DESCRIPTION**

THE SPACECRAFT WAS AN OCTAHEDRON, TOPPED BY A TRUNCATED PYRAMID, WITH A PARABOLIC REFLECTOR FOR A RADAR ALTIMETER ON THE FLAT BOTTOM SIDE. A METAL RIBBON BOOM WITH END MASS EXTENDED UPWARD APPROXIMATELY 6.1 M FROM THE TOP OF THE PYRAMID. PASSIVE LASER RETROREFLECTOR CUBES WERE MOUNTED IN A RING AROUND THE PARABOLIC REFLECTOR WITH THE NORMAL VECTOR FROM EACH CUBE FACING 45 DEG OUTWARD FROM THE EARTH DIRECTION OF THE BOOM AXIS. A TURNSTILE ANTENNA FOR VHF AND UHF FREQUENCIES AND SEPARATE ANTENNAS FOR EARTH-VIEWING, 324-MHZ DOPPLER, C-BAND, AND S-BAND TRANSPONDERS WERE MOUNTED SEPARATELY ON FLAT SURFACES NEXT TO THE PARABOLIC REFLECTOR. THE DIMENSION ACROSS THE FLATS OF THE OCTAHEDRON WAS 1.22 M, AND THE SPACECRAFT WAS 1.11-M HIGH. THE MISSION PROVIDED THE STEPPINGSTONE BETWEEN THE NATIONAL GEODETIC SATELLITE PROGRAM (NGSP) AND THE EARTH AND OCEAN PHYSICS APPLICATION PROGRAM. IT PROVIDED DATA TO REFINE THE GEODETIC AND GEOPHYSICAL RESULTS OF THE NGSP AND SERVED AS A TEST FOR NEW SYSTEMS. MISSION OBJECTIVES WERE TO PERFORM A SATELLITE ALTIMETRY EXPERIMENT IN ORBIT, TO SUPPORT FURTHER THE CALIBRATION AND POSITION DETERMINATION OF NASA AND OTHER AGENCY C-BAND RADAR SYSTEMS, AND TO PERFORM A SATELLITE-TO-SATELLITE TRACKING EXPERIMENT WITH THE ATS 6 SPACECRAFT USING AN S-BAND TRANSPONDER SYSTEM. THIS SYSTEM WAS ALSO USED FOR PERIODIC GEOS 3 TELEMETRY DATA RELAY THROUGH ATS 6, TO SUPPORT FURTHER THE INTERCOMPARISON OF TRACKING SYSTEMS, TO INVESTIGATE THE SOLID-EARTH DYNAMIC PHENOMENA THROUGH PRECISION LASER TRACKING, TO REFINE FURTHER ORBIT DETERMINATION TECHNIQUES, AND DETERMINE INTERDATUM TIES AND GRAVITY MODELS, AND TO SUPPORT THE CALIBRATION AND POSITION DETERMINATION OF NASA-ST-N S-BAND TRACKING STATIONS.

----- GEOS 3, ANDERLE-----

**INVESTIGATION NAME- US NAVY DOPPLER SYSTEM**

NSSDC ID- 75-0274-05

INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
NAVIGATION  
GEODESY

**PERSONNEL**  
PI - R.J. ANDERLE

NASA SURFACE WEAPONS CTR

**BRIEF DESCRIPTION**

THE DOPPLER TECHNIQUE OF TIMING AND MEASURING THE FREQUENCY SHIFT OF RADIO TRANSMISSIONS FROM A MOVING SPACECRAFT WAS USED TO OBTAIN DATA THAT FURTHER ESTABLISHED THE STRUCTURE OF THE EARTH'S GRAVITATIONAL FIELD THROUGH THE COMPARISON OF NEW WITH ESTABLISHED GEODETIC MEASUREMENTS. TWO TRANSMITTERS WERE OPERATED AT FREQUENCIES OF 162 AND 320 MHZ. THE DUAL FREQUENCIES WERE COHERENTLY RELATED AND UTILIZED IN CONJUNCTION WITH GROUND DOPPLER RECEIVING STATIONS TO OBTAIN PRECISION SATELLITE RANGE-RATE DATA. THE DUAL FREQUENCIES WERE GENERATED BY A HIGHLY STABLE OSCILLATOR DRIVING TWO FREQUENCY MULTIPLIERS. BOTH FREQUENCIES WERE USED SIMULTANEOUSLY TO PROVIDE COMPARISON DATA OF THE EFFECT OF THE IONOSPHERE ON THE SIGNALS, WHICH WERE TO CORRECT THE DATA FOR THIS ERROR SOURCE. THIRTEEN OR MORE FIXED GROUND RECEIVING STATIONS OPERATED BY THE U.S. NAVY DOPPLER TRACING NETWORK (STRNET) AND 12 PORTABLE RECEIVERS OPERATED BY THE U.S. ARMY, U.S. NAVY, AND U.S. AIR FORCE -- ALL UNDER THE DIRECTION OF THE DEFENSE MAPPING AGENCY (DMA) -- WERE EXPECTED TO BE IN OPERATION. OBSERVATIONS MADE FROM THREE OR MORE KNOWN STATIONS ALLOWED REDUCTION OF ORBITAL PARAMETERS. RANGE-RATE DATA FROM EITHER THE FIXED STATIONS OR THE RECEIVERS WERE ESTIMATED TO BE ACCURATE WITHIN 0.5 CM/S.

----- GEOS 3, GALICINAO-----

**INVESTIGATION NAME** - SATELLITE-TO-SATELLITE TRACKING

**NSBDC ID** - 75-027A-06

**INVESTIGATIVE PROGRAM**  
CODE ER

**INVESTIGATION DISCIPLINE(S)**  
NAVIGATION

**PERSONNEL**  
PI - J.V. GALICINAO

NASA-GSFC

**BRIEF DESCRIPTION**

THE SATELLITE-TO-SATELLITE TRACKING (SST) SYSTEM USED CONSISTED OF: (1) THE GROUND-BASED APPLICATION TECHNOLOGY SATELLITE RANGING (ATS-R) SYSTEM (MODIFIED FOR SATELLITE-TO-SATELLITE TRACKING), (2) THE WIDEBAND COMMUNICATION TRANSPOUNDER ON THE ATS 6 GEOSYNCHRONOUS SPACECRAFT, AND (3) THE RANGING TRANSPOUNDER ON THE LOW-ORBITING SATELLITE.

----- GEOS 3, JACKSON-----

**INVESTIGATION NAME** - C-BAND SYSTEM

**NSBDC ID** - 75-027A-03

**INVESTIGATIVE PROGRAM**  
CODE ER

**INVESTIGATION DISCIPLINE(S)**  
NAVIGATION

**PERSONNEL**  
PI - E.D. JACKSON

NASA-WFC

**BRIEF DESCRIPTION**

THE C-BAND TRANSPOUNDER SUBSYSTEM CONSISTED OF TWO TRANSPOUNDERS, ONE THE GEOS 2 NONCOHERENT TYPE AND THE OTHER A COHERENT C-BAND TRANSPOUNDER. THE NONCOHERENT TRANSPOUNDER PROVIDED FOR RANGE AND ANGLE MEASUREMENTS, WHILE THE COHERENT TRANSPOUNDER PROVIDED FOR BOTH RANGE, RANGE-RATE, AND ANGLE MEASUREMENTS. BOTH TRANSPOUNDERS RECEIVED SIGNALS AT 6670 MHZ. THE COHERENT TRANSPOUNDER TRANSMITTED AT 5690 MHZ WHILE THE NONCOHERENT TYPE TRANSMITTED AT 5765 MHZ. EACH C-BAND TRANSPOUNDER TRANSMITTED ONE PULSE FOR EACH CODED GROUP OF PULSES TRANSMITTED BY A GROUND TRACKING C-BAND RADAR. THE INTERNAL DELAY BETWEEN THE RECEIVED GROUND TRANSMITTED PULSE CODE AND THE TRANSPOUNDER TRANSMITTED PULSE WAS CALIBRATED PRIOR TO LAUNCH. EACH TRANSPOUNDER (WHILE OPERATING SEPARATELY OR SIMULTANEOUSLY) OPERATED IN EITHER STANDBY OR OVERRIDE MODE. IN STANDBY, THE RECEIVER BECAME OPERATIONAL AFTER APPROXIMATELY 60 S OF INTERROGATION OR LONG ENOUGH FOR THE OUTPUT TUBE TO WARM UP. IN OVERRIDE, THE OUTPUT TUBE FILAMENT WAS ENERGIZED BY THE EXTERNAL COMMAND AND THE GEAR-UP DELAY CIRCUIT BYPASSED AFTER THE TUBE WARMED UP, THUS ALLOWING THE TRANSPOUNDER TO RESPOND IMMEDIATELY TO INTERROGATION SIGNALS. THIS OVERRIDE MODE REDUCED GROUND COMMAND REQUIREMENTS AND CONSERVED SPACECRAFT POWER.

----- GEOS 3, PURDY-----

**INVESTIGATION NAME** - RADAR ALTIMETER SYSTEM

**NSBDC ID** - 75-027A-01

**INVESTIGATIVE PROGRAM**  
CODE ER

**INVESTIGATION DISCIPLINE(S)**  
NAVIGATION  
GEODESY

**PERSONNEL**  
PI - C.L. PURDY

NASA-WFC

**BRIEF DESCRIPTION**

THE RADAR-ALTIMETER EXPERIMENT WAS THE HIGHEST PRIORITY EXPERIMENT ON GEOS 3. THE OBJECTIVES WERE TO DETERMINE THE FEASIBILITY AND UTILITY OF A SPACEDOOME RADAR ALTIMETER FOR MAPPING THE TOPOGRAPHY OF THE OCEAN SURFACE WITH AN ABSOLUTE ACCURACY WITHIN 0.5 M, AND WITH A RELATIVE ACCURACY OF 1 TO 2 M, TO DETERMINE THE FEASIBILITY OF MEASURING THE DEFLECTION OF THE VERTICAL AT SEA, TO DETERMINE THE FEASIBILITY OF MEASURING WAVE HEIGHT, AND TO CONTRIBUTE TO THE TECHNOLOGY LEADING TO A FUTURE OPERATIONAL ALTIMETER-SATELLITE SYSTEM WITH A 10-CM MEASUREMENT CAPABILITY. TO MEET THE EXPERIMENT OBJECTIVES, THE ALTIMETER HAD TWO DISTINCT DATA GATHERING MODES -- A LONG-PULSE ALTIMETRY DATA MODE AND A SHORT-PULSE MODE. PERFORMANCE CAPABILITIES AND OPERATING CHARACTERISTICS OF THE ALTIMETER DIFFERRED FOR THE TWO MODES. BOTH MODES OPERATED ON A 13.7-GHZ FREQUENCY, USED A PARABOLIC ANTENNA, HAD A MAXIMUM RANGE ACQUISITION TIME OF 6 S, AND HAD AN ALTITUDE GRANULARITY OF PLUS OR MINUS 0.2 M. DIFFERING CHARACTERISTICS WERE: (1) ALTITUDE DATA RATE FOR LONG PULSE WAS 2 READINGS/S AND FOR SHORT PULSE 6 READINGS/S, AND (2) INPUT POWER FOR LONG PULSE WAS 35 W, FOR SHORT PULSE 100 W. THE GEOS 3 RADAR ALTIMETER HAD SEVERAL FEATURES IN COMMON WITH THE ALTIMETER USED ON THE SKYLAB SATELLITE, BUT HAD ADVANTAGES OVER THE SKYLAB ALTIMETER BECAUSE OF IMPROVED ACCURACY AND ABILITY TO OPERATE OVER EXTENDED AREAS FOR GREATER PERIODS OF TIME, THEREBY PROVIDING THE CAPABILITY TO EXAMINE THE EARTH OVER LONGER ARCS AND OBSERVE EXTENSIVE OCEAN AREAS.

----- GEOS 3, SALZBERG-----

**INVESTIGATION NAME** - S-BAND TRACKING SYSTEM

**NSBDC ID** - 75-027A-02

**INVESTIGATIVE PROGRAM**  
CODE ER

**INVESTIGATION DISCIPLINE(S)**  
NAVIGATION

**PERSONNEL**  
PI - J.W. SALZBERG

NASA-GSFC

**BRIEF DESCRIPTION**

THE S-BAND TRANSPOUNDER 4011114 PROVIDED METRIC TRACKING DATA (RANGE, RANGE-RATE). IT TRANSMITTED TELEMETRY DATA BUT DID NOT RECEIVE COMMANDS. THE TRANSPOUNDER OPERATED IN THE FOLLOWING THREE MODES: (1) SATELLITE-TO-SATELLITE TRACKING (SST) FROM THE ROSNAN OR EUROPEAN ATS GROUND STATIONS THROUGH ATS 6 TO GEOS 3 AND BACK, (2) DIRECT USD (DOPPLER ONLY) GROUND STATION TRACKING OF GEOS 3, AND (3) DIRECT GRARR GROUND STATION TRACKING OF GEOS 3. THE TRANSPOUNDER SUBSYSTEM CONSISTED OF A SINGLE-CHANNEL TRANSPOUNDER, A POWER AMPLIFIER, A DIPLEXER, AND AN EARTH-VIEWING AND ATS-VIEWING ANTENNA SYSTEM. THE ANTENNAS WERE SELECTABLE BY GROUND COMMAND. THE EARTH-VIEWING ANTENNA FOR DIRECT TRACKING WITH THE USD AND GRARR GROUND STATIONS HAD APPROXIMATELY MERIDIANAL COVERAGE AND A MINIMUM OF 0 DB GAIN WITHIN 60 DEG OF THE SPACECRAFT Z AXIS. THE SST ANTENNA SYSTEM CONSISTED OF AN IN-TRACK ARRAY THAT PROVIDED A 3-DB GAIN IN THE DIRECTION OF ATS FOR GEOS ASCENDING AND DESCENDING MORE THAN WHICH CROSSED THE EQUATOR WITHIN PLUS OR MINUS 70 DEGREES OF THE ATS SUBSATELLITE POINT. IN THE SST OPERATION MODE, THE INTERROGATION SIGNAL WAS FIRST TRANSMITTED AT C-BAND BY THE ATS GROUND STATION TO THE ATS 6 SPACECRAFT. ATS 6 INSTRUMENTATION COHERENTLY ALTERED THE SIGNAL, MAKING IT COMPATIBLE WITH THE INPUT FREQUENCY (2069.1125 MHZ) OF THE S-BAND TRANSPOUNDER ON GEOS 3, AND TRANSMITTED THE SIGNAL TO GEOS 3. GEOS 3 THEN, AFTER TRANSLATING THE RECEIVED SIGNAL, RETRANSMITTED IT TO ATS 6 AS IF ATS 6 WERE ANOTHER GROUND STATION. ATS 6 THEN RETRANSMITTED THE SIGNAL TO THE ATS GROUND STATION AT C-BAND. RANGE, SUM, AND RANGE-RATE SUM WERE OBTAINED BY COMPARING THE INTERROGATION AND RESPONSE SIGNALS. THE S-BAND ON GEOS 3 WAS ALSO TRACKED BY THE USD AND GRARR STATION STATIONS. CARRIER FREQUENCIES (2069.1125 MHZ UP AND 2247 MHZ DOWN) WERE IDENTICAL TO THOSE OF THE SST MODE. COHERENT GROUND TRACKING WAS ACCOMPLISHED VIA STANDARD GRARR RANGING SIDE TONES. USD TRACKING CONSISTED ONLY OF COHERENT-CARRIER DOPPLER TRACKING. THE S-BAND TRANSPOUNDER WAS A SINGLE-CHANNEL TRANSPOUNDER; THEREFORE, SIMULTANEOUS OPERATION WAS NOT POSSIBLE.

----- GEOS 3, STEPHANIDES-----

**INVESTIGATION NAME** - LASER TRACKING REFLECTOR

**NSBDC ID** - 75-027A-06

**INVESTIGATIVE PROGRAM**  
CODE ER

**INVESTIGATION DISCIPLINE(S)**  
NAVIGATION  
GEODESY

**PERSONNEL**  
PI - C.C. STEPHANIDES

NASA-GSFC

**BRIEF DESCRIPTION**

LASER CORNER REFLECTORS, COMPOSED OF 270 (MINIMUM) 35-MM CUBES, AND GROUND-BASED LASER SYSTEMS WERE USED TO OBTAIN PRECISE SATELLITE TRACKING INFORMATION. THE APPLIED PHYSICS LABORATORY PROVIDED THE LASER CUBE REFLECTOR PANELS. THE CUBES WERE CONFIGURED ON THE LATERAL SURFACE OF A CONIC FRUSTUM, WITH THE LATERAL SURFACE OF THE FRUSTUM ADJOINING THE BOTTOM, EARTH-ORIENTED SURFACE OF THE SPACECRAFT AT A 45-DEG ANGLE. THE BASE OF THE FRUSTUM MEASURED APPROXIMATELY 0.5 METERS IN DIAM. WHEN ILLUMINATED BY A LASER LIGHT PULSE FROM THE GROUND, EACH RETROREFLECTOR CUBE IN THE ARRAY REFLECTED THE LIGHT RAY BACK TO A SPECIAL TELESCOPE RECEIVED ON THE GROUND. THE REFLECTED LIGHT WAS PICKED UP BY THE TELESCOPE AND THE OPTICAL

IMPLESES CONVERTED TO AN ELECTRICAL SIGNAL. A DIGITAL COUNTER RECORDED THE TIME WHEN THE LIGHT BEAM WAS RETURNED TO THE GROUND. THE TOTAL TRAVEL TIME OF THE LIGHT PULSES, FROM GROUND TO SATELLITE AND BACK TO THE GROUND, MEASURED THE DISTANCE TO THE SATELLITE, THUS FORMING THE BASIS OF THE SATELLITE OPTICAL LASER SYSTEM. THE FOLLOWING OBSERVATIONAL SYSTEMS ACQUIRED THE NECESSARY DATA -- NASA/WALLOPS LASER RANGING SYSTEMS, SAO LASER RANGING SYSTEMS, GSFC LASER RANGING SYSTEMS, AND OTHER NATIONAL AND INTERNATIONAL LASER STATIONS AS DETERMINED.

----- GMS, KOHNO -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)  
NSSDC ID- 77-065A-02 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - T. KOHNO

METEOROL RES INST

BRIEF DESCRIPTION  
THE SPACE ENVIRONMENT MONITOR (SEM) EXPERIMENT OBSERVED THE IN SITU CHARGED PARTICLE ENVIRONMENT. SOLAR PROTONS (1 TO 500 MEV), ALPHA PARTICLES (8 TO 390 MEV) AND SOLAR ELECTRONS (GREATER THAN 2 MEV) WERE DISCRIMINATED, AND THEIR RESPECTIVE ENERGIES MONITORED BY MEANS OF A NUMBER OF SOLID-STATE DETECTORS.

SPACECRAFT COMMON NAME- GMS  
ALTERNATE NAMES- GEOSTATION,METEOROL,SAT.  
NSSDC ID- 77-065A  
LAUNCH DATE- 07/16/77 WEIGHT- 647. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
JAPAN NASA  
UNITED STATES NASA-GSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/15/77  
ORBIT PERIOD- 1429.4 MIN INCLINATION- 0.0 DEG  
PERIAPSIS- 35531. KM ALT APOAPSIS- 35779. KM ALT

PERSONNEL  
PM - N. KODAIRA METEOROL SATELLITE CTR  
PS - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION  
THE GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS) WAS JAPAN'S CONTRIBUTION TO THE INTERNATIONAL GARP (GLOBAL ATMOSPHERIC RESEARCH PROGRAM). ONE MAJOR OBJECTIVE OF GARP WAS TO OBTAIN SYNTHETIC GLOBAL METEOROLOGICAL DATA SETS FOR ONE YEAR'S DURATION (TO INCLUDE TWO OPTIMIZED OBSERVING PERIODS OF A FEW WEEKS EACH). THESE DATA SERVED AS RAW MATERIAL TO OPTIMIZE COMPUTER MODELS FOR METEOROLOGICAL PREDICTION. IT WAS HOPE THAT DETERMINATION COULD BE MADE OF THE TIME LIMITATION FOR SHORT-TERM MODELING. THIS SPACECRAFT WAS ROUGHLY CYLINDRICAL WITH A HEIGHT OF 345 CM AND DIAMETER OF 216 CM. THE CYLINDRICAL SURFACE WAS COVERED WITH SOLAR CELLS WHICH COULD PROVIDE 225 W. THE SATELLITE WAS SPIN-STABILIZED WITH A DESPUN EARTH-POINTING ANTENNA. THE SATELLITE WAS POSITIONED NEAR 140 DEG E AND DESIGNED TO OPERATE FOR 5 YEARS.

----- GMS, JMA STAFF -----

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 77-065A-01 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION  
THE VISIBLE IR SPIN-SCAN RADIOMETER (VISSR) WAS SIMILAR TO VISSR EXPERIMENTS ON OTHER GARP (GLOBAL ATMOSPHERIC RESEARCH PROGRAM) SATELLITES SUCH AS GOES 1. IT MADE BOTH NIGHT (IR 10.5 TO 12.5 MICROMETERS) AND DAY IR, PLUS VISIBLE (.5 TO .75 MICROMETERS) PHOTOMETRIC OBSERVATIONS OF THE SUBSATELLITE AREA AT 30 MIN INTERVALS. THE VISIBLE CHANNEL HAD A RESOLUTION OF ABOUT 1.25 KM AND THE IR CHANNEL HAD A RESOLUTION OF ABOUT 5 KP AT NADIR. REAL-TIME TRANSMISSION WAS AVAILABLE TO THE DATA ACQUISITION STATION IN JAPAN, WITH ADDITIONAL DATA TRANSMISSION TO OTHER METEOROLOGICAL USERS AS NEEDED.

----- GMS, JMA STAFF -----

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 77-065A-03 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE  
INVESTIGATION DISCIPLINE(S)  
COMMUNICATIONS  
METEOROLOGY

PERSONNEL  
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION  
THE GMS INCLUDED A COMMUNICATIONS FACILITY. THE OBJECTIVES OF THIS EQUIPMENT WERE (1) TO COLLECT AND RELAY WEATHER OBSERVATIONS FROM REMOTE STATIONS, INCLUDING BUOYS, SHIPS, AND UNMANNED STATIONS, AND (2) TO TRANSMIT WEATHER INFORMATION AND ANALYSES FROM THE CENTRAL WEATHER FACILITY TO OTHER WEATHER STATIONS.

----- GOES 1, NESS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 75-100A-01 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - T. KOHNO

METEOROL RES INST

BRIEF DESCRIPTION  
THE SPACE ENVIRONMENT MONITOR (SEM) EXPERIMENT OBSERVED THE IN SITU CHARGED PARTICLE ENVIRONMENT. SOLAR PROTONS (1 TO 500 MEV), ALPHA PARTICLES (8 TO 390 MEV) AND SOLAR ELECTRONS (GREATER THAN 2 MEV) WERE DISCRIMINATED, AND THEIR RESPECTIVE ENERGIES MONITORED BY MEANS OF A NUMBER OF SOLID-STATE DETECTORS.

----- GOES 1 -----

SPACECRAFT COMMON NAME- GOES 1  
ALTERNATE NAMES- SMS-C, GOES-A  
GOES-1

NSSDC ID- 75-100A  
LAUNCH DATE- 10/16/75 WEIGHT- 631. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NOAA-NESS  
UNITED STATES NASA-GSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/17/75  
ORBIT PERIOD- 1412.0 MIN INCLINATION- 1.0 DEG  
PERIAPSIS- 34165. KM ALT APOAPSIS- 36458. KM ALT

PERSONNEL  
PM - R.H. PICKARD NASA-GSFC  
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION  
GOES 1 (SMS-C) WAS A NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIED (1) A VISIBLE INFRARED, SPIN SCAN RADIOMETER (VISSR) TO PROVIDE HIGH-QUALITY DAY AND NIGHT CLOUDCOVER DATA AND TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL APT-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS, AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PROTON, ELECTRON, AND SOLAR X-RAY FLUXES AND MAGNETIC FIELDS. THE CYLINDRICALLY SHAPED SPACECRAFT MEASURED 190.5 CM IN DIAMETER AND 230 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDED AN ADDITIONAL 85 CM BEYOND THE CYLINDER SHELL. THE PRIMARY STRUCTURAL MEMBERS WERE A HONEYCOMBED EQUIPMENT SHELF AND THRUST TUBE. THE VISSR TELESCOPE WAS MOUNTED ON THE EQUIPMENT SHELF AND VIEWED THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDED RADIALLY FROM THE THRUST TUBE AND WAS AFFIXED TO THE SOLAR PANELS, WHICH FORMED THE OUTER WALLS OF THE SPACECRAFT AND PROVIDED THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS WERE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) WERE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USED BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAD ATTAINED SYNCHRONOUS ORBIT. ON DECEMBER 1, 1978 RESPONSIBILITY FOR GOES 1 WAS TURNED OVER TO ESA WHO USED IT AS PART OF GARP. IT WAS STATIONED OVER THE INDIAN OCEAN AND CONTROLLED BY ESOC IN DARMSTADT, FRG. IN DECEMBER, 1979, IT WAS PLACED UNDER THE CONTROL OF NOAA AND POSITIONED AT 135 DEG W.

----- GOES 1, NESS STAFF -----

INVESTIGATION NAME- VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 75-100A-01 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OPS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF  
OI - W.E. SHENK

NOAA-NESS  
NASA-GSFC



PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT ATTAINED SYNCHRONOUS ORBIT.

----- GOES 2, NESS STAFF -----

INVESTIGATION NAME- METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM

NSSDC ID- 77-048A-05

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM WAS AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM DESIGNED TO RECEIVE AND PROCESS METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (OBSERVATION) PLATFORMS (DCP). THE COLLECTED DATA WERE RETRANSMITTED FROM THE SATELLITE TO SMALL GROUND-BASED REGIONAL DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS COULD BE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWED FOR THE RETRANSMISSION OF NARROW-BAND (WEFAK TYPE) DATA FROM CENTRALIZED WEATHER FACILITIES TO EXISTING SMALL GROUND-BASED APT RECEIVING STATIONS. THIS COMMUNICATIONS SYSTEM OPERATED ON S-BAND FREQUENCIES. THE MINIMUM DATA COLLECTION SYSTEM FOR ONE SMALL METEOROLOGICAL SATELLITE CONSISTED OF APPROXIMATELY 3500 DCP STATIONS TO BE CONTACTED IN A 6-H PERIOD. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6-H PERIOD WAS BETWEEN 350K AND 600K BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARIED FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT AN INDIVIDUAL DCP STATION.

----- GOES 2, WILLIAMS -----

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 77-048A-02

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS

NOAA-ERL

BRIEF DESCRIPTION

A NUMBER OF SEPARATE SILICON SOLID-STATE DETECTORS, EACH WITH A TAILORED MODERATOR THICKNESS AND A SEPARATE ELECTRONICS UNIT FOR PULSE AMPLIFICATION AND PULSE-HEIGHT DISCRIMINATION, WERE USED TO OBTAIN THE FOLLOWING PARTICLE TYPE AND ENERGY MEASUREMENTS: SEVEN CHANNELS MEASURING PROTONS IN THE RANGE 1 TO 500 MEV, SIX CHANNELS MEASURING ALPHA PARTICLES IN THE RANGE 4 TO 400 MEV, AND ONE CHANNEL MEASURING ELECTRONS GREATER THAN 2 MEV.

----- GOES 2, WILLIAMS -----

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 77-048A-03

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
SOLAR PHYSICS

PERSONNEL

PI - D.J. WILLIAMS

NOAA-ERL

BRIEF DESCRIPTION

THE X-RAY COUNTER WAS COMPOSED OF A COLLIMATOR, TWO IONIZATION CHAMBERS, AND TWO ELECTROMETERS. A SMALL ANGULAR APERTURE WAS CHOSEN FOR THE TELESCOPE COLLIMATOR, WHICH WAS MOUNTED SO THAT THE DECLINATION OF ITS AXIS COULD BE CONTROLLED BY GROUND COMMAND TO INSURE THAT THE SUN WAS VIEWED BY THE TELESCOPE ONCE DURING EVERY VEHICLE ROTATION. ONE ION CHAMBER WAS FILLED WITH ARGON AT 1 ATM FOR DETECTION OF 1- TO 8-A X RAYS, AND HAD A 1.27E-4 M BERYLLIUM WINDOW TO EXCLUDE X RAYS OF LONGER WAVELENGTHS. THE OTHER CHAMBER WAS FILLED WITH XENON AT 1.5 TO 2 ATM, AND HAD A 1.27E-3 M BERYLLIUM WINDOW FOR MEASUREMENT OF X RAYS IN THE WAVELENGTH RANGE 0.5-TO 3-A.

----- GOES 2, WILLIAMS -----

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 77-048A-04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.J. WILLIAMS

NOAA-ERL

BRIEF DESCRIPTION

THE MAGNETOMETER WAS A BIAXIAL, CLOSED-LOOP, FLUXTUBE MAGNETOMETER WITH THE TWO SENSORS ALIGNED AT RIGHT ANGLES TO ONE ANOTHER. AFTER MOUNTING ON A SHORT BOOM (ABOUT .61 M), ONE SENSOR WAS ALIGNED PARALLEL TO THE SPACECRAFT SPIN AXIS AND THE OTHER PERPENDICULAR TO THIS AXIS. EACH SENSOR HAD A SELECTABLE RANGE (50, 100, 200, OR 400 NT), AN OFFSET FIELD CAPABILITY (PLUS OR MINUS 1200 NT IN 40-NT STEPS), AND AN IN-FLIGHT CALIBRATION CAPABILITY.

\*\*\*\*\* GOES 3 \*\*\*\*\*

SPACECRAFT COMMON NAME- GOES 3  
ALTERNATE NAMES- 10952, GOES-C

NSSDC ID- 78-062A

LAUNCH DATE- 06/16/78  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

WEIGHT- 294. KG

LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES  
UNITED STATES

NOAA-NESS  
NASA-GSFC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1450.8 MIN  
PERIAPSIS- 35469.1 KM ALT

EPOCH DATE- 06/17/78  
INCLINATION- 1.7 DEG

APOAPSIS- 36679.2 KM ALT

PERSONNEL

PI - R.H. PICKARD

NASA-GSFC

PS - W.E. SHENK

NASA-GSFC

BRIEF DESCRIPTION

GOES 3 WAS A NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIED (1) A VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR) TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA AND TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL APT-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS, AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PROTON, ELECTRON, AND SRAY FLUXES AND MAGNETIC FIELDS. THE CYLINDRICALLY-SHAPED SPACECRAFT MEASURED 190.5 CM IN DIAM AND 230 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDED AN ADDITIONAL 83 CM BEYOND THE CYLINDER SHELL. THE PRIMARY STRUCTURAL MEMBERS WERE A HONEYCOMBED EQUIPMENT SHELF AND THRUST TUBE. THE VISSR TELESCOPE WAS MOUNTED ON THE EQUIPMENT SHELF AND VIEWED THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDED RADIALLY OUT FROM THE THRUST TUBE AND WAS AFFIXED TO THE SOLAR PANELS, WHICH FORMED THE OUTER WALLS OF THE SPACECRAFT AND PROVIDED THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS WERE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) WERE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USED BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT ATTAINED ORBIT.

----- GOES 3, NESS STAFF -----

INVESTIGATION NAME- VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 78-062A-01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

PS - W.E. SHENK

NASA-GSFC

BRIEF DESCRIPTION

THE VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR) FLOWN ON GOES 3 WAS CAPABLE OF PROVIDING BOTH DAY AND NIGHT OBSERVATIONS OF CLOUD COVER AND EARTH/CLOUD RADIANCE TEMPERATURE MEASUREMENTS FROM A SYNCHRONOUS SPIN-STABILIZED, GEOSTATIONARY SATELLITE FOR USE IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE TWO-CHANNEL INSTRUMENT WAS ABLE TO TAKE BOTH FULL AND PARTIAL PICTURES OF THE EARTH'S DISK. BOTH THE INFRARED CHANNEL (10.5 TO 12.5 MICRORAMETERS) AND THE VISIBLE CHANNEL (0.55 TO 0.75 MICRORAMETERS) USED A COMMON OPTICS SYSTEM. INCOMING RADIATION WAS RECEIVED BY AN ELLIPTICALLY-SHAPED SCAN MIRROR AND COLLECTED BY A RICHNEY-CHRETIAN OPTICAL SYSTEM. THE SCAN MIRROR WAS SET AT A NOMINAL ANGLE OF 45 DEG TO THE VISSR OPTICAL AXIS, WHICH WAS ALIGNED PARALLEL TO THE SPIN AXIS OF THE SPACECRAFT. THE SPINNING MOTION OF THE SPACECRAFT (APPROXIMATELY 100 RPM) PROVIDED A WEST-TO-EAST SCAN MOTION WHEN THE SPIN AXIS OF THE SPACECRAFT WAS ORIENTED PARALLEL WITH



\*\*\*\*\* HCMR \*\*\*\*\*

SPACECRAFT COMMON NAME- HCMR  
ALTERNATE NAMES- SATS, APL EXPL MISSION A  
HEAT CAPACITY MAP HSN, AEM-A  
10818

NSSDC ID- 78-041A

LAUNCH DATE- 04/26/78 WEIGHT- 117. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- SCOUT-F

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/27/78  
ORBIT PERIOD- 96.7 MIN INCLINATION- 97.6 DEG  
PERIAPSIS- 558. KM ALT APOAPSIS- 646. KM ALT

PERSONNEL  
MG - D.S. DILLER NASA HEADQUARTERS  
SC - B.B. SCHARDT NASA HEADQUARTERS  
PM - C.M. MACKENZIE NASA-GSFC  
PS - J.C. PRICE NASA-GSFC

BRIEF DESCRIPTION  
THE OBJECTIVE OF THE HEAT CAPACITY MAPPING MISSION (HCMR) WAS TO PROVIDE COMPREHENSIVE, ACCURATE, HIGH SPATIAL RESOLUTION THERMAL SURVEYS OF THE SURFACE OF THE EARTH. THE SPACECRAFT WAS SPIN STABILIZED AT A RATE OF 10 RPM. THE HCMR CIRCULAR SUN-SYNCHRONOUS ORBIT ALLOWED THE SPACECRAFT TO SENSE SURFACE TEMPERATURE NEAR THE MAXIMUM AND MINIMUM OF THE DIURNAL CYCLE. THE ORBIT HAD AN ASCENDING DAYLIGHT NOBNE WITH NOMINAL EQUATORIAL CROSSING TIME OF 2:00 PM, AND PROVIDED A 1:30 PM TO 2:30 AM CROSSING TIME OVER MIDDLE NORTHERN LATITUDES. THE ORBIT ALSO ALLOWED FOR REFLECTANCE MEASUREMENTS DURING DAYLIGHT PASSES.

----- HCMR, BARNES -----

INVESTIGATION NAME- HEAT CAPACITY MAPPING RADIOMETER

NSSDC ID- 78-041A-01 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL  
PI - W.L. BARNES NASA-GSFC

BRIEF DESCRIPTION  
THE OBJECTIVES OF THE HEAT CAPACITY MAPPING RADIOMETER (HCMR) WERE AS FOLLOWS -- (1) TO PRODUCE THERMAL MAPS AT THE OPTIMUM TIMES FOR MAKING THERMAL INERTIA STUDIES FOR DISCRIMINATION OF ROCK TYPES AND MINERAL RESOURCES LOCATION; (2) TO MEASURE PLANT CANOPY TEMPERATURES AT FREQUENT INTERVALS TO DETERMINE THE TRANSPIRATION OF WATER AND PLANT LIFE; (3) TO MEASURE SOIL MOISTURE EFFECTS BY OBSERVING THE TEMPERATURE CYCLE OF SOILS; (4) TO MAP THERMAL EFFLUENTS, BOTH NATURAL AND MAN-MADE; (5) TO INVESTIGATE THE FEASIBILITY OF GEOTHERMAL SOURCE LOCATION BY REMOTE SENSING; AND (6) TO PROVIDE FREQUENT COVERAGE OF SNOW FIELDS FOR WATER RUNOFF PREDICTION. THE HCMR TRANSMITTED ANALOG DATA IN REAL TIME TO SELECTED RECEIVING STATIONS. IT WAS DESIGNED TO PROVIDE ACCURATE, HIGH SPATIAL RESOLUTION THERMAL MAPS OF THE SURFACE OF THE EARTH AT AN OPTIMUM TIME FOR DETERMINATION OF THERMAL INERTIA. THE HIGH THERMAL RESOLUTION DATA WERE ALSO USED TO MAP THERMAL GRADIENTS IN BODIES OF WATER. THE RADIOMETER WAS SIMILAR TO THE HIGH-RESOLUTION SURFACE COMPOSITION MAPPING RADIOMETER (HRSCMR) OF NIMBUS 5 (72-097A). THE HCMR HAD A SMALL INSTANTANEOUS GEOMETRIC FIELD OF VIEW (LESS THAN 1 BY 1 MILLIRADIANS), HIGH RADIOMETRIC ACCURACY, AND A WIDE ENOUGH SWATH COVERAGE ON THE GROUND SO THAT SELECTED AREAS WERE COVERED WITHIN THE 12-H PERIOD CORRESPONDING TO THE MAXIMUM AND MINIMUM OF TEMPERATURE OBSERVED. THE INSTRUMENT OPERATED IN TWO CHANNELS, 10.5 TO 12.5 MICROMETERS (IR) AND 0.8 TO 1.1 MICROMETERS (VISIBLE). THE LATTER CHANNEL WAS MATCHED TO THE ERTS-1 (72-058A) BAND 4. THE INSTRUMENT UTILIZED A RADIATION COOLER TO COOL THE TWO HE-CD-TE DETECTORS TO 100 DEG K. THE EXPERIMENT INCLUDED AN ANALOG MULTIPLEXER THAT ACCEPTED THE ANALOG OUTPUT OF EACH DETECTOR AND MULTIPLEXED THEM IN A FORM SUITABLE FOR TRANSMISSION BY THE SPACECRAFT S-BAND TRANSMITTER. THE DATA WERE AVAILABLE THROUGH THE EROS DATA CENTER, SIOUX FALLS, SD. MORE COMPLETE INFORMATION CAN BE FOUND IN SMITH, S.R. 'APPLICATIONS EXPLORER MISSIONS (AEM) MISSION PLANNER'S HANDBOOK.'

\*\*\*\*\* HEAO 2 \*\*\*\*\*

SPACECRAFT COMMON NAME- HEAO 2  
ALTERNATE NAMES- HIGH ENERGY ASTRON OBS-B, 11101  
HEAO-B, EINSTEIN

NSSDC ID- 78-103A

LAUNCH DATE- 11/13/78 WEIGHT- 2660. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/14/78  
ORBIT PERIOD- 94.0 MIN INCLINATION- 23.5 DEG  
PERIAPSIS- 465. KM ALT APOAPSIS- 476. KM ALT

PERSONNEL  
MG - R.E. HALPERN NASA HEADQUARTERS  
SC - A.G. OPP NASA HEADQUARTERS  
PM - F.A. SPEER NASA-GSFC  
PS - S.S. HOLY NASA-GSFC

BRIEF DESCRIPTION  
THIS SECOND MISSION WAS A POINTING MISSION PROVIDING MORE DETAILED INFORMATION ABOUT PREVIOUSLY IDENTIFIED X-RAY SOURCES. A LARGE GRAZING-INCLINATION X-RAY TELESCOPE PROVIDED IMAGES OF SOURCES THAT WERE THEN ANALYZED BY INTERCHANGEABLE INSTRUMENTS AT THE FOCAL PLANE OF THE TELESCOPE. THE TELESCOPE COLLECTED X-RAYS OVER AN ANGULAR RANGE OF APPROXIMATELY 1 DEG X 1 DEG, WITH THE FOCAL PLANE INSTRUMENTS DETERMINING THE LIMITING RESOLUTION FOR EACH MEASUREMENT. THESE INSTRUMENTS INCLUDED A SOLID-STATE X-RAY DETECTOR, A CURVED-CRYSTAL BRAGG SPECTROMETER, AN IMAGING PROPORTIONAL COUNTER, AND A CHANNEL-PLATE IMAGING ARRAY. IN ADDITION, A MONITOR PROPORTIONAL COUNTER VIEWED THE SKY ALONG THE TELESCOPE AXIS. THE SCIENTIFIC OBJECTIVES WERE TO -- (1) ACCURATELY LOCATE AND EXAMINE X-RAY SOURCES IN THE ENERGY RANGE 0.2 TO 4.0 KEV WITH HIGH RESOLUTION; (2) PERFORM HIGH-SPECTRAL-SENSITIVITY MEASUREMENTS WITH BOTH HIGH- AND LOW-DISPERSION SPECTROGRAPHS; (3) PERFORM HIGH-SENSITIVITY MEASUREMENTS OF TRANSIENT X-RAY BEHAVIOR. THE SAME TYPE OF SPACECRAFT USED FOR HEAD 1 WAS EMPLOYED; I.E., A SIX-SIDED STRUCTURE 5.68 M HIGH AND 2.67 M IN DIAMETER. DOWNLINK TELEMETRY WAS AT A DATA RATE OF 6.5 KB/S FOR REAL-TIME DATA AND 128 KB/S FOR EITHER OF TWO TAPE-RECODER SYSTEMS. AN ATTITUDE-CONTROL-AND-DETERMINATION SUBSYSTEM WAS USED TO POINT AND MANEUVER THE SPACECRAFT. GYROS, SUN SENSORS, AND STAR TRACKERS WERE EMPLOYED AS SENSING DEVICES.

----- HEAO 2, GIACCONI -----

INVESTIGATION NAME- MONITOR PROPORTIONAL COUNTER

NSSDC ID- 78-103A-01 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL  
PI - R. GIACCONI SAO  
OI - H.D. TANANBAUM SAO  
OI - G.W. CLARK MASS INST OF TECH  
OI - S.S. HOLT NASA-GSFC  
OI - R. NOVICK COLUMBIA U

BRIEF DESCRIPTION  
THIS EXPERIMENT UTILIZED A MONITOR COUNTER AS A SUPPORT INSTRUMENT FOR CALIBRATION AND NORMALIZATION OF THE FOCAL-PLANE INSTRUMENTATION. IT WAS USED TO (1) NORMALIZE INTENSITY FLUCTUATIONS DURING SPECTROMETER OBSERVATIONS; (2) OBSERVE THE CONTINUUM DURING SPECTRAL LINE OBSERVATIONS; AND (3) CALIBRATE CERTAIN INSTRUMENTS IN FLIGHT.

----- HEAO 2, GIACCONI -----

INVESTIGATION NAME- HIGH-RESOLUTION IMAGER

NSSDC ID- 78-103A-02 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL  
PI - R. GIACCONI SAO  
OI - H.D. TANANBAUM SAO  
OI - G.W. CLARK MASS INST OF TECH  
OI - S.S. HOLT NASA-GSFC  
OI - R. NOVICK COLUMBIA U

BRIEF DESCRIPTION  
THE OBJECTIVES OF THIS INVESTIGATION WERE TO (1) DETECT AND ACCURATELY LOCATE X-RAY SOURCES FROM 0.2 TO 4.0 KEV; (2) STUDY THE STRUCTURE OF OBJECTS LARGER THAN 2 ARC S; AND (3) MEASURE THE INTENSITY AND TEMPORAL CHARACTERISTICS OF INDIVIDUAL SOURCES. THIS INSTRUMENT WAS A CHANNEL-PLATE IMAGING ARRAY OF DETECTORS WITH A PIXEL SIZE CORRESPONDING TO APPROXIMATELY 2 ARC S.

----- HEAD 2, GIACCONI -----

INVESTIGATION NAME- CURVED-CRYSTAL BRAGG X-RAY  
NSSDC ID- 78-103A-03 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R. GIACCONI SAO  
OI - H.D. TANANBAUM SAO  
OI - G.W. CLARK MASS INST OF TECH  
OI - S.S. HOLT NASA-GSFC  
OI - R. NOVICK COLUMBIA U

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT WAS TO SEARCH FOR X-RAY SPECTRAL-LINE EMISSIONS ARISING FROM THE SELECTED CELESTIAL OBJECTS. THE SEARCH WAS LIMITED TO THE ENERGY LEVEL FROM 0.1R TO 3 KEV. THE INSTRUMENT WAS A CURVED-CRYSTAL BRAGG SPECTROMETER USING THE FOLLOWING SIX CRYSTALS: LEAD STEARATE AND LEAD LAURATE WHICH GAVE RESOLUTIONS IN LAMBDA/DELTA LAMBDA OF 50-100; TAP, 70-200; PET, 100-300; RAP, 150-1000; AND APP, 200-1000. THE X-RAY LINES WERE DETECTED BY A THIN-WINDOW POSITION-SENSITIVE PROPORTIONAL COUNTER.

----- HEAD 2, GIACCONI -----

INVESTIGATION NAME- IMAGING PROPORTIONAL COUNTER  
NSSDC ID- 78-103A-04 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R. GIACCONI SAO  
OI - H.D. TANANBAUM SAO  
OI - G.W. CLARK MASS INST OF TECH  
OI - S.S. HOLT NASA-GSFC  
OI - R. NOVICK COLUMBIA U

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS EXPERIMENT WERE (1) TO SURVEY X-RAY SOURCES OF AN EXTENDED NATURE IN THE ENERGY RANGE FROM 0.1 TO 4 KEV, WHERE RESOLUTION OF 1 ARC MIN WAS SUFFICIENT, (2) TO STUDY THE ANGULAR STRUCTURE OF EXTENDED SOURCES, (3) TO SURVEY FOR WEAK SOURCES, AND (4) TO LOCATE OBJECTS WITH POORLY KNOWN POSITIONS.

----- HEAD 2, GIACCONI -----

INVESTIGATION NAME- SOLID-STATE X-RAY DETECTOR  
NSSDC ID- 78-103A-05 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R. GIACCONI SAO  
OI - H.D. TANANBAUM SAO  
OI - G.W. CLARK MASS INST OF TECH  
OI - S.S. HOLT NASA-GSFC  
OI - R. NOVICK COLUMBIA U

BRIEF DESCRIPTION

THIS INSTRUMENT WAS A COOLED SOLID-STATE SPECTROMETER AND WAS USED TO DETECT WEAK SOURCES AND WEAK SPECTRAL FEATURES OVER A BROAD BAND OF ENERGIES BY EMPLOYING A NONDISPERSIVE SPECTRAL TECHNIQUE. A LITHIUM-DRIFTED, SOLID-STATE DETECTOR WAS OPERATED AT A TEMPERATURE OF 120 DEG K. THE PRIMARY DETECTOR WAS 6 MM IN DIAMETER AND WAS SURROUNDED BY TWO VETO GUARD COUNTERS. A TWO-STAGE SOLID CRYOGEN REFRIGERATOR WAS USED TO COOL THE DETECTOR. SPECTRAL MEASUREMENTS WERE MADE BETWEEN 0.5 AND 4 KEV, WITH A RESOLUTION FROM 120 TO 150 EV, FWHM AND AN EFFICIENCY GREATER THAN 0.9.

\*\*\*\*\* HEAD 3 \*\*\*\*\*

SPACECRAFT COMMON NAME- HEAD 3  
ALTERNATE NAMES- HIGH ENERGY ASTRON OBS3, 11532

NSSDC ID- 79-082A

LAUNCH DATE- 09/20/79 WEIGHT- 2660. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 94.5 MIN  
PERIAPSIS- 486.4 KM ALT

EPOCH DATE- 09/21/79  
INCLINATION- 43.6 DEG  
APOAPSIS- 504.9 KM ALT

PERSONNEL

PI - R.E. HALPERN  
OI - A.G. OPP  
PI - F.A. SPEER  
PS - T.A. PARNELL

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS THIRD MISSION PERFORMS A SKY SURVEY OF GAMMA RAYS AND COSMIC RAYS IN A MANNER SIMILAR TO HEAD 1. IT HAS A HIGHER ORBITAL INCLINATION THAN THE PREVIOUS MISSIONS IN THIS SERIES SINCE THE PAYLOAD CONSISTS PRIMARILY OF COSMIC-RAY INSTRUMENTATION; GREATER COSMIC-RAY FLUX OCCURS NEAR THE EARTH'S MAGNETIC POLES. THE SCIENTIFIC OBJECTIVES OF THE MISSION ARE TO -- (1) DETERMINE THE ISOTOPIC COMPOSITION OF THE MOST ABUNDANT COMPONENTS OF THE COSMIC-RAY FLUX WITH ATOMIC MASS BETWEEN 7 AND 56, AND THE FLUX OF EACH ELEMENT WITH ATOMIC NUMBER (Z) BETWEEN Z = 4 AND Z = 50; (2) SEARCH FOR SUPER-HEAVY NUCLEI UP TO Z = 120, AND MEASURE THE COMPOSITION OF THE NUCLEI WITH Z > 20; (3) STUDY INTENSITY, SPECTRUM, AND TIME BEHAVIOR OF X-RAY AND GAMMA-RAY SOURCES BETWEEN 0.06 AND 10 MEV, AND MEASURE ISOTROPY OF THE DIFFUSE X-RAY AND GAMMA-RAY BACKGROUND; AND (4) PERFORM AN EXPLORATORY SEARCH FOR X- AND GAMMA-RAY LINE EMISSIONS. THE NORMAL OPERATING MODE IS A CONTINUOUS CELESTIAL SCAN ABOUT THE Z-AXIS (WHICH NOMINALLY POINTS TO THE SUN).

----- HEAD 3, ISRAEL -----

INVESTIGATION NAME- HEAVY NUCLEI

NSSDC ID- 79-082A-03

INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - M.H. ISRAEL WASHINGTON U  
PI - E.C. STONE CALIF INST OF TECH  
PI - C.J. WADDINGTON U OF MINNESOTA  
OI - M.R. BINNS MC DONNELL DOUGLASS CORP  
OI - J. KLARMANN WASHINGTON U  
OI - R.E. VOGT CALIF INST OF TECH

BRIEF DESCRIPTION

THE PURPOSE OF THIS EXPERIMENT IS TO MEASURE THE CHARGE SPECTRUM OF COSMIC-RAY NUCLEI OVER THE NUCLEAR CHARGE RANGE FROM 17 TO 120 IN THE ENERGY INTERVAL 0.3- TO 10-GEV/NUCLEON TO CHARACTERIZE COSMIC RAY SOURCES, PROCESSES OF SYNTHETICS, AND PROPAGATION MODES. THE DETECTOR CONSISTS OF A DOUBLE-ENDED INSTRUMENT OF UPPER AND LOWER HODOSCOPE AND THREE DUAL-GAP ION CHAMBERS. THE TWO ENDS ARE SEPARATED BY A CERENKOV RADIATOR. THE GEOMETRICAL FACTOR IS 4 SQ CM-SR. THE ION CHAMBERS CAN RESOLVE CHARGE TO 0.24 CHARGE UNITS AT LOW ENERGY AND 0.39 CHARGE UNITS AT HIGH ENERGY AND HIGH Z. THE CERENKOV COUNTER CAN RESOLVE 0.3 TO 0.4 CHARGE UNITS.

----- HEAD 3, JACOBSON -----

INVESTIGATION NAME- GAMMA-RAY LINE SPECTROMETER

NSSDC ID- 79-082A-01

INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY  
X-RAY ASTRONOMY

PERSONNEL

PI - A.S. JACOBSON NASA-JPL  
OI - J.R. ARNOLD U OF CALIF, SAN DIEGO  
OI - A.E. METZGER NASA-JPL  
OI - L.E. PETERSON U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

THE BASIC GOALS OF THIS EXPERIMENT ARE TO SEARCH FOR GAMMA-RAY LINE EMISSIONS ARISING FROM A VARIETY OF SOURCE PHENOMENA. PARTICULAR EMPHASIS IS PLACED ON FINDING LINE EMISSIONS FROM NUCLEOSYNTHESIS PROCESSES IN SUPERNOVAE, AND FROM POSITRON-ELECTRON ANNIHILATION AND NUCLEAR REACTIONS IN LOW-ENERGY COSMIC RAYS. IN ADDITION, CAREFUL STUDY IS MADE OF THE SPECTRAL AND TIME VARIATIONS OF KNOWN HARD X-RAY SOURCES. THE EXPERIMENT IS CAPABLE OF MEASURING GAMMA-RAY LINES FALLING WITHIN THE ENERGY INTERVAL FROM 0.06 TO 10 MEV, AND WITH AN ENERGY RESOLUTION BETTER THAN 2.5 KEV AT 1.33 MEV AT A LINE SENSITIVITY FROM 1.E-4 TO 1.E-5 PHOTONS/SQ CM/S, DEPENDING ON THE ENERGY. THE EXPERIMENTAL PACKAGE CONTAINS FOUR COOLED DRIFTED GERMANIUM DETECTORS SHIELDED BY CESIUM IODIDE. THE KEY EXPERIMENTAL PARAMETERS ARE -- (1) GEOMETRY FACTOR OF 11.1 SQ CM-SR, (2) A FIELD OF VIEW OF 27 DEG FWHM AND, (3) A TIME RESOLUTION OF LESS THAN 0.1 MS FOR THE GERMANIUM DETECTOR AND 10 S FOR THE CESIUM IODIDE DETECTOR.

ORIGINAL PAGE IS  
OF POOR QUALITY

----- HEAD 3, KOCH -----

INVESTIGATION NAME- ISOTOPIC COMPOSITION OF COSMIC RAYS

NSSDC ID- 70-082A-04

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - L.	KOCH	CENS
PI - B.	PETERS	DANISH SPACE RES INST
OI - J.J.	ENGLERAN	CENS
OI - M.	CANTIN	CENS
OI - A.	SOUTOU	CENS
OI - P.	HASSE	CENS
OI - N.	HESTREAU	CENS
OI - I.	LUND	DANISH SPACE RES INST
OI - D.	RASMUSSEN	DANISH SPACE RES INST
OI - N.J.	BYRNACK	DANISH SPACE RES INST
OI - R.	WESTERGARD	DANISH SPACE RES INST
OI - T.	ROTHENBERG	DANISH SPACE RES INST
OI - N.	RIO	CENS
OI - P.	PETROW	CENS
OI - G.	GOREB	CENS

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURES THE RELATIVE COMPOSITION OF THE ISOTOPES OF THE PRIMARY COSMIC RAYS BETWEEN BERYLLIUM AND IRON (Z FROM 4 TO 26) AND THE ELEMENTAL ABUNDANCES UP TO TiN (Z=50). CEPHENOV COUNTERS AND HODOSCOPES TOGETHER WITH THE EARTH'S MAGNETIC FIELD FORM A SPECTROMETER. THEY DETERMINE CHARGE AND MASS OF COSMIC RAYS TO A PRECISION OF 10 PERCENT FOR THE MOST ABUNDANT ELEMENTS OVER THE MOMENTUM RANGE FROM 2 TO 25 GEV/C.

\*\*\*\*\* HELIOS-A \*\*\*\*\*  
SPACECRAFT COMMON NAME- HELIOS-A  
ALTERNATE NAMES- HELIO-A, PL-741A  
HELIOS 1

NSSDC ID- 74-097A

LAUNCH DATE- 12/10/74 WEIGHT- 371.2 KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY

FED REP OF GERMANY	BRW
UNITED STATES	NASA-GSFC

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC	EPOCH DATE- 01/16/75
ORBIT PERIOD- 190.15 DAYS	INCLINATION- 0.02 DEG
PERIAPSIS- 0.3695 AU RAD	APOAPSIS- 0.985 AU RAD

PERSONNEL

MG - E.J. MONTOYA	NASA HEADQUARTERS
SC - A.G. OPP	NASA HEADQUARTERS
PM - A. KUTZER	GES FUR WELTRAUMFORSCH
PM - G.W. OUSLEY	NASA-GSFC
PS - H. PORSCHE	BFVLR
PS - J.H. TRAINOR	NASA-GSFC

BRIEF DESCRIPTION

THIS SPACECRAFT WAS ONE OF A PAIR OF DEEP SPACE PROBES DEVELOPED BY THE FEDERAL REPUBLIC OF GERMANY (FRG) IN A COOPERATIVE PROGRAM WITH NASA. EXPERIMENTS WERE PROVIDED BY SCIENTISTS FROM BOTH FRG AND THE U.S. NASA SUPPLIED THE TITAN/CENTAUR LAUNCH VEHICLE. THE SPACECRAFT WAS EQUIPPED WITH TWO BOOMS AND A 32-M ELECTRIC DIPOLE. THE PAYLOAD CONSISTED OF A FLUGATE MAGNETOMETERS, ELECTRIC AND MAGNETIC FIELD EXPERIMENTS, WHICH COVERED VARIOUS BANDS IN THE FREQUENCY RANGE 6 Hz TO 3 MHz; CHARGED PARTICLE EXPERIMENTS, WHICH COVERED VARIOUS ENERGY RANGES STARTING WITH SOLAR WIND THERMAL ENERGIES AND EXTENDING TO 1 GeV; A ZODIACAL LIGHT EXPERIMENT; AND A MICROMETEOROID EXPERIMENT. THE PURPOSE OF THE MISSION WAS TO MAKE PIONEERING MEASUREMENTS OF THE INTERPLANETARY MEDIUM FROM THE VICINITY OF THE EARTH'S ORBIT TO 0.5 AU. THE SPIN AXIS WAS NORMAL TO THE ECLIPTIC, AND THE NOMINAL SPIN RATE WAS 1 RPS. THE OUTER SPACECRAFT SURFACE WAS DIELECTRIC, EFFECTIVELY (BECAUSE OF THE SHEATH POTENTIAL) RAISING THE LOW-ENERGY THRESHOLD FOR THE SOLAR WIND PLASMA EXPERIMENT TO AS HIGH AS 100 EV. ALSO, SHEATH-RELATED COUPLING CAUSED BY THE SPACECRAFT ANTENNAE PRODUCED INTERFERENCE WITH THE WAVE EXPERIMENTS. THE SPACECRAFT WAS CAPABLE OF BEING OPERATED AT BIT RATES FROM 4096 TO 8 BPS, VARIABLE BY FACTORS OF TWO. WHILE THE SPACECRAFT WAS MOVING TO PERHELION, IT WAS GENERALLY OPERATED FROM 64 TO 256 BPS; AND NEAR 0.5 AU, IT WAS OPERATED AT THE HIGHEST BIT RATE. BECAUSE OF A DEPLOYMENT FAILURE OF ONE AXIS OF THE 32-M, TIP-TO-TIP, DIPOLE ANTENNA, ONE AXIS WAS SHORTED, CAUSING THE ANTENNA TO FUNCTION AS A MONPOLE. THE MAJOR EFFECT OF THIS ANOMALY WAS TO INCREASE THE EFFECTIVE INSTRUMENT THRESHOLDS, AND TO INTRODUCE ADDITIONAL UNCERTAINTIES IN THE EFFECTIVE ANTENNA LENGTH. INSTRUMENT DESCRIPTIONS WRITTEN BY THE EXPERIMENTERS WERE PUBLISHED (SOME IN GERMAN, SOME IN ENGLISH) IN THE JOURNAL 'RAUMFAHRTFORSCHUNG', VOL. 19, NO. 5, SEPT. 1975.

----- HELIOS-A, FECHTIG -----

INVESTIGATION NAME- MICROMETEOROID DETECTOR AND ANALYZER

NSSDC ID- 74-097A-12

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY PHYSICS  
INTERPLANETARY DUST

PERSONNEL

PI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - J.	WEINRAUCH	MPI-PHYS ASTROPHYS

BRIEF DESCRIPTION

THE PURPOSE OF THE EXPERIMENT (E10) WAS TO INVESTIGATE SOME THEORIES ABOUT THE INTERPLANETARY DUST INCLUDING WHETHER (1) THE NUMBER OF PARTICLES INCREASES TOWARD THE SUN, (2) THE CUTOFF FOR SMALL PARTICLES IS DEPENDENT ON THE DISTANCE FROM THE SUN, BECAUSE SOLAR PRESSURE INCREASES NEARER THE SUN, AND (3) THE NUMBER DENSITIES OF PARTICLES CHANGE NEAR THE ORBITS OF PLANETS. THE KINETIC ENERGY OF DUST PARTICLES HITTING A TARGET WITH HIGH VELOCITY (SEVERAL KM/S) CAUSED THE MATERIAL TO VAPORIZATE AND BECOME PARTIALLY IONIZED. THE GENERATED PLASMA CLOUD WAS THEN SEPARATED BY APPROPRIATE VOLTAGES INTO ITS NEGATIVE (ELECTRON) PART AND INTO POSITIVE IONS. THE PASS AND THE ENERGY OF THE DUST PARTICLES WAS DETERMINED FROM THE IMPULSE HEIGHTS. A TIME-OF-FLIGHT MASS SPECTROMETER IN CONNECTION WITH THE TARGET ALLOWED THE SMALL ION CLOUD TO BE ANALYZED. IN THIS WAY THE INVESTIGATION OF THE CHEMICAL COMPOSITION OF THE DUST PARTICLES BECAME POSSIBLE. THE THRESHOLD FOR THE DETECTION OF A PARTICLE WAS ABOUT 1.E-15 G. MASS AND ENERGY DETERMINATION WAS POSSIBLE FOR PARTICLES LARGER THAN ABOUT 1.E-14 G. FOR PARTICLES LARGER THAN 1.E-13 G, A MASS SPECTRUM WAS GATHERED. FOR FURTHER DETAILS, SEE PP 268-269 OF 'RAUMFAHRTFORSCHUNG', 19, 5, SEPT./OCT. 1975.

----- HELIOS-A, GURNETT -----

INVESTIGATION NAME- COARSE FREQUENCY, FINE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 74-097A-04

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLOGG	U OF MINNESOTA
OI - S.J. BAUER	NASA-GSFC
OI - R.G. STONE	NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT (ESA) SHARED THE 32 M, TIP-TO-TIP ELECTRIC ANTENNA WITH EXPERIMENTS -05 AND -06. THE INSTRUMENT CONSISTED OF A 16-CHANNEL SPECTRUM ANALYZER WITH APPROXIMATELY LOGARITHMICALLY EQUISPACED CENTER FREQUENCIES, 16 LOG COMPRESSORS, 16 R-C INTEGRATORS FOR AVERAGING THE LOG COMPRESSED ELECTRIC FIELD AMPLITUDE BETWEEN READOUTS, AND 16 PEAK DETECTORS WHICH WERE RESET AFTER READOUT. THE 16 AVERAGES AND 16 PEAK LOG VALUES WERE SAMPLED ALMOST SIMULTANEOUSLY. THE CHANNELS COVERED THE FREQUENCY RANGE OF ABOUT 20 Hz TO 200 kHz, WITH FOUR CHANNELS PER DECADE OF FREQUENCY. THE LOG COMPRESSORS HAD A DYNAMIC RANGE OF 100 dB. SAMPLING RATE DEPENDED IN DETAIL ON THE SPACECRAFT BIT RATE AND TELEMETRY FORMAT. THE FASTEST REAL TIME TELEMETERED RATE WAS FOR 16 AVERAGES AND 16 PEAK VALUES TO BE SAMPLED EVERY 1.125 s. WHENEVER A VERY STRONG SIGNAL WAS DETECTED IN A PRE-SELECTED CHANNEL, THE SHOCK ALARM DATA MODE WAS INITIATED IN WHICH THE ELECTRIC FIELD, SPECTRUM, MAGNETIC FIELD, AND PLASMA DATA WERE RECORDED INTO SPACECRAFT MEMORY FOR A PERIOD STARTING BEFORE AND TERMINATING AFTER THE TRIGGERING SIGNAL TIME. THE MAXIMUM SAMPLING RATE OF THE SPECTRUM DATA IN THIS MODE WAS 16.2 SAMPLES PER s FOR EACH CHANNEL. ONE HALF OF THE DIPOLE ANTENNA FAILED TO EXTEND PROPERLY AND WAS SHORT CIRCUITED TO THE SPACECRAFT GROUND. THE RESULTANT CONFIGURATION WAS THAT OF A MONPOLE WHICH WAS CALCULATED TO HAVE AN EFFECTIVE LENGTH OF APPROXIMATELY 8 M. THE PRIMARY PERTINENT EFFECTS WERE THE LOSS OF 6 dB IN E FIELD SENSITIVITY DUE TO THE SHORTENED ANTENNA AND THE INCREASE IN THE 178 kHz CHANNEL BY 25 dB. SOLAR CELL AND SHEATH EFFECTS CAUSED INTERFERENCE IN THE LOWEST 6 CHANNELS (WHICH WAS LESS SEVERE WITH INCREASING CHANNEL FREQUENCY). FOR MORE DETAILS, SEE J. GEOPHYS. RES., 82, P 632, 1975, AND P 245-247 OF 'RAUMFAHRTFORSCHUNG', 19, 5, SEPT./OCT. 1975.

----- HELIOS-A, GURNETT -----

INVESTIGATION NAME- FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 74-097A-05

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLLOGG	U OF MINNESOTA
OI - S.J. BAUER	NASA-GSFC
OI - R.G. STONE	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (ESB) SHARED THE 32-M, TIP-TO-TIP, ELECTRIC DIPOLE ANTENNA WITH EXPERIMENTS -04 AND -06. INSTRUMENTATION CONSISTED OF THREE TUNABLE PLASMA WAVE RECEIVERS, A FIXED-FREQUENCY WIDEBAND RECEIVER, AND A WAVE FORM SAMPLER. THE TUNABLE RECEIVERS AND WIDEBAND RECEIVER PROVIDED DATA FOR DIRECT TELEMETRY TO EARTH. EACH OF THE TUNABLE RECEIVERS COVERED A DIFFERENT FREQUENCY BAND IN THE RANGE 1 HZ TO 200 kHz. THE HIGH FREQUENCY RECEIVER HAD 96 FREQUENCY SETTINGS SEPARATED BY ABOUT 4 PERCENT AND COVERED THE FREQUENCY RANGE 6.4 kHz TO 205 kHz. THE MID-RANGE RECEIVER HAD 48 FREQUENCY SETTINGS SEPARATED BY ABOUT 8 PERCENT AND COVERED THE RANGE 208 kHz TO 6.07 kHz. THE LOW-FREQUENCY RECEIVER HAD 24 SETTINGS WITH 15 PERCENT SEPARATION AND COVERED THE RANGE 11 Hz TO 309 Hz. THE RESPONSE TIME OF THE LOW-FREQUENCY RECEIVER WAS APPROXIMATELY 1 s, NECESSITATING THE INCLUSION OF THE WIDEBAND RECEIVER TO OBTAIN INFORMATION ABOUT THE ANGULAR DISTRIBUTION OF WAVES APPEARING IN THE LOW-FREQUENCY BAND. THIS RECEIVER COVERED THE FREQUENCY RANGE 1 Hz TO 200 Hz. THE TIME RESOLUTION DEPENDED IN DETAIL ON THE SPACECRAFT TELEMETRY FORMAT, BIT RATE, AND EXPERIMENT OPERATIONAL MODE. WHEN THE SHOCK ALARM MODE BECAME ACTIVATED, DATA FROM THE WAVE FORM SAMPLER WERE READ INTO SPACECRAFT MEMORY FOR A PERIOD STARTING BEFORE AND ENDING AFTER THE TRIGGERING EVENT. IN THIS MODE, THE INSTANTANEOUS VOLTAGE ACROSS THE ANTENNA WAS PASSED THROUGH A LOW PASS FILTER WITH CORNER FREQUENCY DEPENDENT ON THE SAMPLING RATE, AND MEASURED AT DISCRETE INTERVALS, THE MOST RAPID BEING 2.2 ms. ONE HALF OF THE ELECTRIC DIPOLE FAILED TO DEPLOY PROPERLY, AND BECAME SHORT CIRCUITED TO GROUND. THE RESULTING CONFIGURATION WAS THAT OF A MONOPOLE WITH AN OPERATIONAL EFFECTIVE LENGTH OF ABOUT 8 m. THIS RESULTED IN A 6 dB LOSS IN SENSITIVITY, AND AN INCREASED RECEIVER NOISE LEVEL, PARTICULARLY AT LOW FREQUENCIES. IN ADDITION, THE HIGH-GAIN TELEMETRY ANTENNA PRODUCED ADDITIONAL INTERFERENCE. FOR A MORE DETAILED DISCUSSION, SEE P 248 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-A, GURNETT -----

**INVESTIGATION NAME-** 50-KHZ TO 2-PHZ RADIO WAVE

**NSSDC ID-** 74-097A-06

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
RADIO PHYSICS  
PARTICLES AND FIELDS  
SCALAR PHYSICS

**PERSONNEL**

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLLOGG	U OF MINNESOTA
OI - R.R. UEBER	NASA-GSFC
OI - R.G. STONE	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (ESC) SHARED THE 32-M, TIP-TO-TIP, ELECTRIC DIPOLE ANTENNA WITH EXPERIMENTS -04 AND -05. A DUAL (REDUNDANT) 16-FREQUENCY CHANNEL RADIOMETER, WITH APPROXIMATELY LOGARITHMICALLY SPACED CHANNELS, WAS USED TO DETECT TYPE III RADIO EMISSIONS ASSOCIATED WITH SOLAR FLARE EVENTS IN THE FREQUENCY BAND 26.5 kHz TO 3 MHz. THE EXPERIMENT SAMPLING RATE WAS SYNCHRONIZED SUCH THAT EACH SPACECRAFT REVOLUTION WAS DIVIDED INTO 32 SECTORS. THE SEQUENCE AND FREQUENCY OF SAMPLING DEPENDED ON THE INSTRUMENT OPERATIONAL MODE (ONE OF FOUR) AND THE SPACECRAFT BIT RATE. THE MOST RAPID SAMPLING POSSIBLE FOR A SINGLE FREQUENCY CHANNEL WAS ONCE EVERY 1/32 OF A SATELLITE SPIN PERIOD, OR ABOUT .03 s. A TYPICAL SAMPLING SEQUENCE WAS FOR ONE FREQUENCY CHANNEL TO BE SAMPLED FOR 16 SECTORS (1/2 REVOLUTION), FOLLOWED BY THE NEXT. ONE-HALF OF THE 32-M DIPOLE FAILED TO EXTEND PROPERLY DURING DEPLOYMENT, AND WAS SHORDED TO GROUND. THE RESULTING ANTENNA CONFIGURATION WAS THAT OF A MONOPOLE WITH AN OPERATIONAL EFFECTIVE LENGTH OF ABOUT 8 m. THIS SHORTER CONFIGURATION RESULTED IN INCREASED RADIO FREQUENCY INTERFERENCE (RFI) OF FROM 3 TO 30 dB ABOVE EXPECTED LEVELS, AND A LOSS OF 6 dB IN GAIN. ANOTHER PROBLEM WAS UNEXPECTED INTERFERENCE WITH THE HIGH-GAIN TELEMETRY ANTENNA. THIS ADDED 60 dB RFI AT 27.5 kHz, DECREASING WITH INCREASING FREQUENCY, SO THAT ABOVE 200 kHz IT PRODUCED NO DETECTABLE INTERFERENCE. FOR MORE DETAILS ABOUT THE INSTRUMENT AND MODES OF OPERATION, SEE P 250 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-A, KEPPLER -----

**INVESTIGATION NAME-** ENERGETIC ELECTRON DETECTOR

**NSSDC ID-** 74-097A-10

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS

**PERSONNEL**

PI - E. KEPPLER
OI - B. WILKEN
OI - D.J. WILLIAMS

MPI-AERONOMY  
MPI-AERONOMY  
NOAA-ERL

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THE EXPERIMENT (EB) WAS TO STUDY THE ORIGIN AND THE DISTRIBUTION MECHANISM OF LOW-ENERGY ELECTRONS AND PROTONS. THE INSTRUMENT, A MAGNETIC SPECTROMETER, CONSISTED OF SIX SEMICONDUCTOR DETECTORS WITH THE FIELD OF VIEW IN THE PLANE OF THE ECLIPTIC. SPECIES SEPARATION WAS ACHIEVED BY AN INHOMOGENEOUS MAGNETIC FIELD ORIENTED PERPENDICULAR TO THE PARTICLE PATH. FOUR ELECTRON AND TWO PROTON DETECTORS MEASURED ELECTRONS FROM 20 TO 1000 KEV AND PROTONS FROM 80 TO 1000 KEV. THE PROTON MEASUREMENTS WERE MADE WITH A TWO-DETECTOR TELESCOPE EMPLOYING COINCIDENCE AND ANTI-COINCIDENCE LOGIC. BOTH PARTICLE SPECIES WERE MEASURED IN 16 ENERGY CHANNELS THROUGH PULSE HEIGHT ANALYSIS. FOR FURTHER INFORMATION SEE PP 261-263 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPTEMBER/OCTOBER 1975.

----- HELIOS-A, KUNDT -----

**INVESTIGATION NAME-** CELESTIAL MECHANICS

**NSSDC ID-** 74-097A-14

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY  
CELESTIAL MECHANICS

**PERSONNEL**

PI - W. KUNDT
OI - W.G. MELBOURNE

U OF HAMBURG  
NASA-JPL

**BRIEF DESCRIPTION**

THIS EXPERIMENT USED THE TRACKING DATA TO OBTAIN A DETAILED SPACECRAFT ORBIT AND IMPROVED KNOWLEDGE OF THE ORBITAL ELEMENTS OF THE EARTH-MOON SYSTEM AND GENERAL RELATIVITY PARAMETERS.

----- HELIOS-A, KUNOW -----

**INVESTIGATION NAME-** COSMIC-RAY PARTICLES

**NSSDC ID-** 74-097A-07

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
COSMIC RAYS

**PERSONNEL**

PI - H. KUNOW	U OF KIEL
OI - G.H. WIBBERENZ	U OF KIEL
OI - G. GREEN	U OF KIEL
OI - M. MUELLER-MELLIN	U OF KIEL
OI - M. WITZE	U OF KIEL
OI - H. HENKE	U OF KIEL

U OF KIEL  
U OF KIEL

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THE EXPERIMENT (EG) WAS TO STUDY HIGH-ENERGY, CHARGED, COSMIC-RAY PARTICLES OF SOLAR, PLANETARY, AND GALACTIC ORIGIN IN INTERPLANETARY SPACE. PROTONS AND ALPHA PARTICLES WITH ENERGIES >7, 1.3 MEV/NUCLEON, AND ELECTRONS >7, 0.3 MEV WERE MEASURED WITHIN INTERPLANETARY SPACE OVER THE RANGE FROM 0.3 TO 1.0 AU. THE INSTRUMENT, A PARTICLE TELESCOPE WITH A 55-DEG FIELD OF VIEW, CONSISTED OF FIVE SEMICONDUCTOR DETECTORS, ONE SAPPHIRE CERENKOV COUNTER, AND ONE SCINTILLATION COUNTER, ALL ENCLOSED BY AN ANTI-COINCIDENCE CYLINDER. THE TELESCOPE WAS CALIBRATED PRIOR TO LAUNCH USING RADIACTIVE SOURCES, PARTICLE ACCELERATORS, AND GROUND-LEVEL MUONS. IT MEASURED PROTONS AND ALPHA PARTICLES IN SIX CHANNELS (1.3-3.5, 3.5-13, 13-27, 27-37, 37-45, AND >7.45 MEV/NUCLEON) AND ELECTRONS IN FIVE ENERGY CHANNELS (0.3-0.8, 0.8-2, 2-3, 3-4, AND >7.4 MEV). FOR MORE DETAIL SEE PP 253-257 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPTEMBER/OCTOBER 1975.

----- HELIOS-A, LEINERT -----

**INVESTIGATION NAME-** ZODIACAL LIGHT PHOTOMETER

**NSSDC ID-** 74-097A-11

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
INTERPLANETARY PHYSICS  
ZODIACAL LIGHT

**PERSONNEL**

PI - C. LEINERT
OI - E. PIETZ

MPI-ASTRONOMIE  
MPI-ASTRONOMIE

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E9) CONSISTED OF THREE PHOTOMETERS LOOKING AT 15 DEG, 30 DEG, AND 90 DEG FROM THE ECLIPTIC. THESE PHOTOMETERS OBSERVED THE INTENSITY AND POLARIZATION OF THE ZODIACAL LIGHT IN UV, BLUE, AND VISUAL BANDS. THE PURPOSE OF THIS EXPERIMENT WAS TO OBTAIN INFORMATION ABOUT THE SPATIAL DISTRIBUTION, SIZE, AND NATURE OF INTERPLANETARY DUST PARTICLES. FOR FURTHER DETAILS, SEE PP 264-267 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPTEMBER/OCTOBER 1975.

----- HELIOS-A, NESS -----

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS

NSSDC ID- 74-097A-02

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - N.F. NESS  
OI - F. MARIANI  
OI - L.F. DURLAGA  
OI - S.C. CANTARANO

NASA-GSFC  
U OF ROME  
NASA-GSFC  
CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

THIS EXPERIMENT (E3) CONSISTED OF A BOOM-MOUNTED, TRIAXIAL-FLUXGATE MAGNETOMETER. AN AUTOMATIC IN-FLIGHT RANGE SWITCH SYSTEM SELECTED THE OPTIMUM OF FOUR RANGES THAT WERE MINUS TO PLUS 16, 48, 144, AND 432 NT PER SENSOR. THESE HAD CORRESPONDING DIGITIZATION RESOLUTIONS OF MINUS TO PLUS 0.03, 0.09, 0.28, AND 0.84 NT. A SENSOR FLIPPER WAS ACTUATED EVERY 36 H TO ASSIST IN SENSOR ZERO LEVEL DETERMINATION. FOR TELEMETRY BIT RATES ABOVE 256 BPS, VECTOR MEASUREMENTS WERE MADE AT RATES BETWEEN 1 AND 16 PER S, DEPENDING ON BIT RATES. AT LOWER BIT RATES, AVERAGES AND VARIANCES WERE COMPUTED ON BOARD FOR TRANSMISSION TO EARTH.

----- HELIOS-A, NEUBAUER -----

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS

NSSDC ID- 74-097A-01

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - F.M. NEUBAUER  
OI - A. MAIER

BRUNSWICK TECH U  
BRUNSWICK TECH U

BRIEF DESCRIPTION

THE INSTRUMENT (E2) CONSISTED OF A TRIAXIAL FLUXGATE MAGNETOMETER MOUNTED ON A 2.75-M BOOM TO MAKE MAGNETIC FIELD MEASUREMENTS UP TO 4 Hz. DATA FROM EACH AXIS WERE FIRST SENT THROUGH A LOW-PASS FILTER WITH THE 3 DB ATTENUATION POINT AT 4 Hz. DEPENDING ON THE TELEMETRY FORMAT AND BIT RATE, THE DATA WERE FED EITHER INTO A TIME-AVERAGING COMPUTER OR DIRECTLY CONNECTED TO TELEMETRY. A SHOCK IDENTIFICATION COMPUTER TRIGGERED THE STORAGE OF RAPID RATE DATA IN THE SPACECRAFT MEMORY WHEN THERE WERE DISCONTINUITIES IN THE VARIATIONS OF THE AMBIENT MAGNETIC FIELD. TWO MEASUREMENT RANGES WERE USED, PLUS OR MINUS 100 AND 400 NT WITH RESOLUTIONS OF PLUS OR MINUS 0.2 AND 0.8 NT, RESPECTIVELY. THE INSTRUMENT WAS EQUIPPED WITH A FLIPPER MECHANISM, WHICH RE-ORIENTED EACH SENSOR BY 90 DEG PERIODICALLY. FOR DETAILED INFORMATION, SEE P 232 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-A, NEUBAUER -----

INVESTIGATION NAME- SEARCH COIL MAGNETOMETER

NSSDC ID- 74-097A-03

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - F.M. NEUBAUER  
OI - G. DEHMEL

BRUNSWICK TECH U  
BRUNSWICK TECH U

BRIEF DESCRIPTION

THIS EXPERIMENT (E4) WAS DESIGNED TO INVESTIGATE THE MAGNETIC COMPONENT OF ELECTROMAGNETIC WAVES IN THE SOLAR WIND FROM 0.3 TO 1.0 AU. BY MEANS OF ITS WAVEFORM CHANNEL (WFC) THE RAPID VARIATIONS OF THE MAGNETIC FIELD WERE MEASURED UP FROM PLUS OR MINUS 8.75 NT TO PLUS OR MINUS 275 NT IN THREE ORTHOGONAL DIRECTIONS FROM 4 TO 128 Hz. A SPECTRUM ANALYZER OBSERVED THE FIELD COMPONENTS IN THE ECLIPSTIC PLANE AND PERPENDICULAR TO IT, TO OBTAIN THE POWER SPECTRAL DENSITY AND PEAK VALUES FOR EIGHT LOGARITHMICALLY SPACED CHANNELS IN THE RANGE FROM 4.7 TO 2200 Hz. BECAUSE OF THE LARGE AMOUNT OF DATA PRODUCED BY THIS EXPERIMENT, AN ADAPTIVE DATA REDUCTION WAS APPLIED. FOR INTERESTING TIME INTERVALS SELECTED BY THE FLUXGATE MAGNETOMETER (74-097A-01, NEUBAUER) OR GURNETT (-04), WAVEFORM DATA COULD BE READ INTO AN ON-BOARD MEMORY AT A RAPID RATE TO BE TRANSMITTED SLOWLY AFTERWARDS. FOR MORE DETAILED INFORMATION SEE P 241 IN "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-A, ROSENBAUER -----

INVESTIGATION NAME- PLASMA DETECTORS

NSSDC ID- 74-097A-09

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - H.R. ROSENBAUER  
OI - H. PELLKOFER  
OI - J.H. WOLFE

MPI-AERONOMY  
MPI-EXTRATERR PHYS  
NASA-ARC

BRIEF DESCRIPTION

THIS EXPERIMENT (E1) EMPLOYED THREE PLASMA ANALYZERS FOR POSITIVE IONS AND ONE FOR ELECTRONS. ALL DETECTORS WERE MOUNTED NORMAL TO THE SPIN AXIS. POSITIVE IONS WITH ENERGY PER CHARGE WITHIN THE RANGE 0.195 TO 15.32 KEV/e WERE MEASURED IN TWO ANGULAR DIMENSIONS USING A COMBINATION OF A HEMISPHERICAL, A QUADRISPERICAL, AND A SINUSOIDALLY SHAPED ELECTROSTATIC ANALYZER. ELECTRONS WITH ENERGY FROM 0.5 TO 1660 EV WERE MEASURED WITH A HEMISPHERICAL ELECTROSTATIC ANALYZER IN ONE DIMENSION. THE EXPERIMENT OPERATED IN SEVERAL MODES WITH DIFFERENT TIME RESOLUTION DEPENDING IN DETAIL ON TELEMETRY FORMAT AND SATELLITE BIT RATE. TYPICAL TIME RESOLUTION WAS ON THE ORDER OF A MINUTE. ALSO, WHENEVER THE SPECIAL SHOCK ALARM MODE WAS triggered BY EXPERIMENTS -04 OR -01, HIGH TIME RESOLUTION PLASMA DATA FOR A PERIOD BEFORE AND AFTER THE EVENT WAS RECORDED INTO SPACECRAFT MEMORY FOR LATER TRANSMISSION. BECAUSE THE SPACECRAFT BODY WAS DIELECTRIC, SHEATH POTENTIALS OF UP TO 100 EV DEGRADED THE USEFULNESS OF DATA TAKEN IN THE LOWER ELECTRON ENERGY CHANNELS. THIS PHENOMENON WAS JUDGED TO HAVE MINIMAL EFFECTS ON THE USEFULNESS OF THE ION DATA. FOR MORE DETAILED INFORMATION SEE P 226 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-A, TRAINOR -----

INVESTIGATION NAME- GALACTIC AND SOLAR COSMIC RAYS

NSSDC ID- 74-097A-08

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
PARTICLES AND FIELDS

PERSONNEL

PI - J.H. TRAINOR  
OI - E.C. ROEOF  
OI - B.J. TEEGARDEN  
OI - F.D. McDONALD  
OI - K.G. McCracken

NASA-GSFC  
APPLIED PHYSICS LAB  
NASA-GSFC  
NASA-GSFC  
CSIRO

BRIEF DESCRIPTION

THE DETECTOR COMPLEMENT OF THIS EXPERIMENT (E7) CONSISTED OF THREE SEPARATE DELTA E/DELTA X VS E TELESCOPES AND A PROPORTIONAL COUNTER FOR MONITORING SOLAR C-RAYS IN THE RANGE 2-8 KEV. THE HIGH ENERGY TELESCOPE HAD A GEOMETRIC FACTOR OF 0.22 SQ CM-SR AND MEASURED ELECTRONS IN THREE RANGES BETWEEN 2 AND 8 KEV, AND PROTONS AND ALPHA PARTICLES IN THREE RANGES BETWEEN 20 AND 56 MEV/N. PROTONS ABOVE 230 MEV ARE ALSO MEASURED. THE FIRST LOW-ENERGY TELESCOPE (GEOMETRIC FACTOR WAS 0.155 SQ CM-SR) MEASURED PROTONS AND 2.1 GT. 1 PARTICLES IN THREE RANGES BETWEEN 3 AND 21 MEV/N. THE SECOND LOW-ENERGY TELESCOPE (GEOMETRIC FACTOR WAS 0.015 SQ CM-SR) MEASURED PROTONS IN SEVERAL RANGES BETWEEN 0.12 AND 2.1 MEV/N, ALPHA PARTICLES IN THE RANGES 0.6-2.1 AND 6-21.2 MEV/N, AND ELECTRONS IN FOUR RANGES BETWEEN 0.12 AND 2 MEV. FOR A NUMBER OF COINCIDENCE MODES, COUNTING RATE DATA SECTORED INTO EIGHT 45 DEG SECTORS WERE OBTAINED. THE DATA CYCLE TIME WAS DEPENDENT ON THE SPACECRAFT TELEMETRY RATE (VARIABLE BETWEEN 4096 AND 8 BITS/S) AND FORMAT. UNDER OPTIMUM CONDITIONS, FIVE EVENTS PER SECOND WERE PULSE HEIGHT ANALYZED AND THE RATE DATA CYCLE IS OF THE ORDER OF 5 MINUTES. AT THE SLOWEST COMBINATION OF BIT RATE AND FORMAT, A COMPLETE DATA CYCLE REQUIRES ABOUT 2.5 HOURS. SEE "IEEE TRANS. ON NUC. SCI.-" NS-22, 570, 1975, AND "RAUMFAHRTFORSCHUNG," 19, 5, PP 258-260, 1975, FOR FURTHER DETAILS.

\*\*\*\*\* HELIOS-B \*\*\*\*\*

SPACECRAFT COMMON NAME- HELIOS-B  
ALTERNATE NAMES- HELIO-B, PL-751A  
HELIOS 2

NSSDC ID- 76-003A

LAUNCH DATE- 01/15/76  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

WEIGHT- 371.2 KG

SPONSORING COUNTRY/AGENCY  
FED REP OF GERMANY  
UNITED STATES

BRWF  
NASA-OSS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- 185.6 DAYS  
PERIAPSIS- 0.289 AU RAD

EPOCH DATE- 07/21/76  
INCLINATION- 0. DEG  
AFOAPSIS- 0.983 AU RAD

**PERSONNEL**

MG - E.J. MONTOYA	NASA HEADQUARTERS
SC - A.G. OPP	NASA HEADQUARTERS
PM - A. KUTZER	GES FÜR WELTRAUMFORSCH
PM - G.W. OUSLEY	NASA-GSFC
PS - H. PORSCHE	DFVLR
PS - J.H. TRAINOR	NASA-GSFC

**BRIEF DESCRIPTION**

THIS SPACECRAFT WAS ONE OF A PAIR OF DEEP SPACE PROBES DEVELOPED BY THE FEDERAL REPUBLIC OF GERMANY (FRG) IN A COOPERATIVE PROGRAM WITH NASA. EXPERIMENTS WERE PROVIDED BY SCIENTISTS FROM BOTH FRG AND THE U.S. NASA SUPPLIED THE TITAN/CENTAUR LAUNCH VEHICLE. THE SPACECRAFT WERE EQUIPPED WITH TWO BOOMS AND A 32-M ELECTRIC DIPOLE. THE PAYLOAD CONSISTED OF A FLUXGATE MAGNETOMETER, ELECTRIC AND MAGNETIC FIELD EXPERIMENTS, WHICH COVERED VARIOUS BANDS IN THE FREQUENCY RANGE 6 Hz TO 3 MHz; CHARGED PARTICLE EXPERIMENTS, WHICH COVERED VARIOUS ENERGY RANGES STARTING WITH SOLAR WIND THERMAL ENERGIES AND EXTENDING TO 1 GeV; A ZODIACAL LIGHT EXPERIMENT; AND A MICROMETEOROID EXPERIMENT. THE PURPOSE OF THE MISSION WAS TO MAKE PIONEERING MEASUREMENTS OF THE INTERPLANETARY MEDIUM FROM THE VICINITY OF THE EARTH'S ORBIT TO 0.3 AU. THE SPACECRAFT WAS SPIN STABILIZED WITH THE SPIN AXIS NORMAL TO THE ECLIPSTIC, AND A NOMINAL SPIN RATE OF 1 RPS. THE OUTER SURFACE WAS COATED WITH A CONDUCTIVE MATERIAL, RESULTING IN A PLASMA SHEATH POTENTIAL OF TYPICALLY 5 EV. SHEATH-RELATED COUPLING CAUSED BY THE SPACECRAFT ANTENNAE PRODUCED INTERFERENCE WITH THE WAVE EXPERIMENTS, BUT THE CHARACTER OF THE INTERFERENCE WAS DIFFERENT THAN THAT OBSERVED ON THE HELIOS 1 SPACECRAFT. THE SPACECRAFT WAS CAPABLE OF BEING OPERATED AT BIT RATES OF FROM 4096 TO 8 BPS, VARIABLE BY FACTORS OF TWO. WHILE THE SPACECRAFT WAS MOVING TO PERHELION, IT WAS GENERALLY OPERATED FROM 64 TO 256 BPS, AND NEAR 0.3 AU, IT WAS OPERATED AT HIGHER BIT RATES. BECAUSE OF DIFFICULTY ENCOUNTERED WITH THE HIGH GAIN ANTENNA, AND SCHEDULING CONFLICTS WITH VIKING, RELATIVELY LESS HIGH BIT RATE DATA WERE OBTAINED FROM HELIOS-B THAN WAS AVAILABLE FROM HELIOS-A. INSTRUMENT DESCRIPTIONS WRITTEN BY THE EXPERIMENTS ARE PUBLISHED (SOME IN GERMAN, SOME IN ENGLISH) IN THE JOURNAL 'RAUMFAHRTFORSCHUNG,' VOL. 19, NO. 5, SEPT./OCT., 1975.

**----- HELIOS-B, FECHTIG -----**

INVESTIGATION NAME- MICROMETEOROID DETECTOR AND ANALYZER

NSSDC ID- 76-003A-12

INVESTIGATIVE PROGRAM  
CODE SL/CO-OPINVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST  
INTERPLANETARY PHYSICS**PERSONNEL**

PI - H. FECHTIG	MPI-NUCLEAR PHYS
OI - J. WEINRAUCH	MPI-PHYS ASTROPHYS

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT (E10) WAS TO INVESTIGATE SOME THEORIES ABOUT THE INTERPLANETARY DUST INCLUDING WHETHER (1) THE NUMBER OF PARTICLES INCREASES TOWARD THE SUN, (2) THE CUTOFF FOR SMALL PARTICLES IS DEPENDENT ON THE DISTANCE FROM THE SUN, BECAUSE SOLAR PRESSURE INCREASES NEARER THE SUN, AND (3) THE NUMBER DENSITIES OF PARTICLES CHANGE NEAR THE ORBITS OF PLANETS. THE DETECTOR UTILIZED THE FACT THAT THE KINETIC ENERGY OF DUST PARTICLES HITTING A TARGET WITH HIGH VELOCITY (SEVERAL KM/S) CAUSES THE MATERIAL TO VAPORIZES AND BECOME PARTIALLY IONIZED. THE GENERATED PLASMA CLOUD WAS SEPARATED BY APPROPRIATE VOLTAGES INTO ITS NEGATIVE (ELECTRON) PART AND INTO POSITIVE IONS. FROM THE IMPULSE HEIGHTS, THE MASS AND THE ENERGY OF THE DUST PARTICLES WERE DETERMINED. A TIME-OF-FLIGHT MASS SPECTROMETER IN CONNECTION WITH THE TARGET ALLOWED THE SMALL ION CLOUD TO BE ANALYZED, MAKING POSSIBLE THE INVESTIGATION OF THE CHEMICAL COMPOSITION OF THE DUST PARTICLES. THE THRESHOLD FOR THE DETECTION OF A PARTICLE WAS ABOUT 1.E-15 G. MASS AND ENERGY DETERMINATION WAS POSSIBLE FOR PARTICLES LARGER THAN ABOUT 1.E-14 G. FOR PARTICLES LARGER THAN 1.E-13 G, A MASS SPECTRUM COULD BE GATHERED. FOR FURTHER DETAILS, SEE PP 268-269 OF 'RAUMFAHRTFORSCHUNG,' 19, 5, SEPT./OCT. 1975.

**----- HELIOS-B, GURNETT -----**

INVESTIGATION NAME- COARSE FREQUENCY, FINE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 76-003A-04

INVESTIGATIVE PROGRAM  
CODE SL/CO-OPINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES AND RADIO PHYSICS**PERSONNEL**

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLOGG	U OF MINNESOTA
OI - S.J. BAUER	NASA-GSFC
OI - R.G. STONE	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E5A) SHARED THE 32-M, TIP-TO-TIP, ELECTRIC ANTENNA WITH EXPERIMENTS -03 AND -06. THE INSTRUMENT CONSISTED OF A 16 CHANNEL SPECTRUM ANALYZER WITH APPROXIMATELY LOGARITHMICALLY EQUISPACED CENTER FREQUENCIES, 16 LOG COMPRESSORS, 16 R-C INTEGRATORS FOR AVERAGING, THE LOG COMPRESSED ELECTRIC FIELD AMPLITUDE BETWEEN READOUTS, AND 16 PEAK DETECTORS WHICH WERE RESET AFTER READOUT. THE 16 AVERAGES AND 16 PEAK LOG VALUES WERE SAMPLED ALMOST SIMULTANEOUSLY. THE CHANNELS COVERED THE FREQUENCY RANGE OF ABOUT 20 Hz TO 800 kHz, WITH FOUR CHANNELS PER DECADE OF FREQUENCY. THE LOG COMPRESSORS HAD A DYNAMIC RANGE OF 100 dB. SAMPLING RATE DEPENDED IN DETAIL ON THE SPACECRAFT BIT RATE AND TELEMETRY FORMAT. THE FASTEST REAL TIME TELEMETERED RATE WAS FOR 16 AVERAGES AND 16 PEAK VALUES TO BE SAMPLED EVERY 1.125 s. WHENEVER A VERY STRONG SIGNAL WAS DETECTED IN A PRE-SELECTED CHANNEL, THE SHOCK ALARM DATA MODE WAS INITIATED IN WHICH THE ELECTRIC FIELD, SPECTRUM, MAGNETIC FIELD, AND PLASMA DATA WERE RECORDED INTO SPACECRAFT MEMORY FOR A PERIOD STARTING BEFORE AND TERMINATING AFTER THE TRIGGERING SIGNAL TIME. THE MAXIMUM SAMPLING RATE OF THE SPECTRUM DATA IN THIS MODE WAS 16.8 SAMPLES PER S FOR EACH CHANNEL. INTERFERENCE, CAUSED BY SOLAR CELL NOISE, OCCURRED PRIMARILY IN THE LOWEST SIR CHANNELS, AND HARMONICS RELATED TO THE SPIN FREQUENCY AND THE SPACECRAFT SHEATH. HOWEVER, A COMBINATION OF FACTORS, INCLUDING THE PROPER DEPLOYMENT OF THE DIPOLE ANTENNA AND THE CONDUCTIVE SPACECRAFT COATING, RESULTED IN DATA FROM THIS SPACECRAFT BEING OF HIGHER QUALITY THAN DATA FROM HELIOS-A. FOR FURTHER DETAILS, SEE PP 245-247 OF 'RAUMFAHRTFORSCHUNG,' 19, 5, 1975.

**----- HELIOS-B, GURNETT -----**

INVESTIGATION NAME- FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 76-003A-05

INVESTIGATIVE PROGRAM  
CODE SL/CO-OPINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES AND RADIO PHYSICS**PERSONNEL**

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLOGG	U OF MINNESOTA
OI - S.J. BAUER	NASA-GSFC
OI - R.G. STONE	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E5B) SHARED THE 32-M, TIP-TO-TIP, ELECTRIC DIPOLE ANTENNA WITH EXPERIMENTS -04 AND -05. INSTRUMENTATION CONSISTED OF THREE TUNABLE PLASMA WAVE RECEIVERS, A FIXED-FREQUENCY WIDEBAND RECEIVER, AND A WAVE FORM SAMPLER. THE TUNABLE RECEIVERS AND WIDEBAND RECEIVER PROVIDED DATA FOR DIRECT TELEMETRY TO EARTH. EACH OF THE TUNABLE RECEIVERS COVERED A DIFFERENT FREQUENCY BAND IN THE RANGE 1 Hz TO 200 kHz. THE HIGH FREQUENCY RECEIVER HAD 96 FREQUENCY SETTINGS SEPARATED BY ABOUT 4 PERCENT AND COVERED THE FREQUENCY RANGE 6.4 kHz TO 205 kHz. THE MID-RANGE RECEIVER HAD 48 FREQUENCY SETTINGS SEPARATED BY ABOUT 8 PERCENT AND COVERED THE RANGE 208 Hz TO 6.07 kHz. THE LOW-FREQUENCY RECEIVER HAD 24 SETTINGS WITH 15 PERCENT SEPARATION AND COVERED THE RANGE 11 Hz TO 309 Hz. THE RESPONSE TIME OF THE LOW-FREQUENCY RECEIVER WAS APPROXIMATELY 1 s, NECESSITATING THE INCLUSION OF THE WIDEBAND RECEIVER TO OBTAIN INFORMATION ABOUT THE ANGULAR DISTRIBUTION OF WAVES APPEARING IN THE LOW-FREQUENCY BAND. THIS RECEIVER COVERED THE FREQUENCY RANGE 1 Hz TO 200 Hz. THE TIME RESOLUTION DEPENDED IN DETAIL ON THE SPACECRAFT TELEMETRY FORMAT, BIT RATE, AND EXPERIMENT OPERATIONAL MODE. WHEN THE SHOCK ALARM MODE BECAME ACTIVATED, DATA FROM THE WAVE FORM SAMPLER WERE READ INTO SPACECRAFT MEMORY FOR A PERIOD STARTING BEFORE AND ENDING AFTER THE TRIGGERING EVENT. IN THIS MODE, THE INSTANTANEOUS VOLTAGE ACROSS THE ANTENNA WAS PASSED THROUGH A LOW PASS FILTER WITH CORNER FREQUENCY DEPENDENT ON THE SAMPLING RATE, AND MEASURED AT DISCRETE INTERVALS. THE MOST RAPID BEING 2.2 ms. FOR A MORE DETAILED DISCUSSION SEE P 248 OF 'RAUMFAHRTFORSCHUNG,' 19, 5, 1975.

**----- HELIOS-B, GURNETT -----**

INVESTIGATION NAME- 50-KHZ TO 2-MHz RADIO WAVE

NSSDC ID- 76-003A-06

INVESTIGATIVE PROGRAM  
CODE SL/CO-OPINVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
RADIO PHYSICS  
PARTICLES AND FIELDS**PERSONNEL**

PI - D.A. GURNETT	U OF IOWA
OI - P.J. KELLOGG	U OF MINNESOTA
OI - R.G. STONE	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E5C) SHARED THE 32-M, TIP-TO-TIP, ELECTRIC DIPOLE ANTENNA WITH EXPERIMENTS -04 AND -05. A DUAL (REDUNDANT) 16-FREQUENCY CHANNEL RADIOMETER, WITH APPROXIMATELY LOGARITHMICALLY SPACED CHANNELS, WAS USED TO DETECT TYPE III RADIO EMISSIONS ASSOCIATED WITH SOLAR FLARE EVENTS IN THE FREQUENCY BAND 26.5 kHz TO 3 MHz. THE EXPERIMENT SAMPLING RATE WAS SYNCHRONIZED SUCH THAT EACH SPACECRAFT REVOLUTION WAS

ORIGINAL PAGE IS  
OF POOR QUALITY

DIVIDED INTO 32 SECTORS. THE SEQUENCE AND FREQUENCY OF SAMPLING DEPENDED ON THE INSTRUMENT OPERATIONAL MODE (ONE OF FOUR) AND THE SPACECRAFT BIT RATE. THE MOST RAPID SAMPLING POSSIBLE FOR A SINGLE FREQUENCY CHANNEL WAS ONCE EVERY 1/32 OF A SATELLITE SPIN PERIOD, OR ABOUT .03 S. A TYPICAL SAMPLING SEQUENCE WAS FOR ONE FREQUENCY CHANNEL TO BE SAMPLED FOR 16 SECTORS (1/16 REVOLUTIONS), FOLLOWED BY THE NEXT. FOR MORE DETAILS ABOUT THE INSTRUMENT AND MODES OF OPERATION, SEE P 258 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-B, KEPPLER -----

INVESTIGATION NAME- ENERGETIC ELECTRON DETECTOR

NSBDC ID- 76-003A-10 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - E. KEPPLER	RPI-AERONOMY
OI - D. WILKEN	RPI-AERONOMY
OI - D.J. WILLIAMS	NOAA-ERL

BRIEF DESCRIPTION

THE OBJECTIVE OF THE EXPERIMENT (E8) WAS TO STUDY THE ORIGIN AND THE DISTRIBUTION MECHANISM OF LOW-ENERGY ELECTRONS AND PROTONS. THE INSTRUMENT, A MAGNETIC SPECTROMETER, CONSISTED OF SIX SEMICONDUCTOR DETECTORS WITH THE FIELD OF VIEW IN THE PLANE OF THE ECLIPSTIC. SPECIES SEPARATION WAS ACHIEVED BY AN INHOMOGENEOUS MAGNETIC FIELD ORIENTED PERPENDICULAR TO THE PARTICLE PATH. FOUR ELECTRON AND TWO PROTON DETECTORS MEASURED ELECTRONS FROM 20 TO 1000 KEV AND PROTONS FROM 80 TO 1000 KEV. THE PROTON MEASUREMENTS WERE MADE WITH A TWO-DETECTOR TELESCOPE EMPLOYING COINCIDENCE AND ANTICOINCIDENCE LOGICS. BOTH PARTICLE SPECIES WERE MEASURED IN 16 ENERGY CHANNELS THROUGH PULSE HEIGHT ANALYSIS. FOR FURTHER INFORMATION SEE PP 261-263 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPTEMBER/OCTOBER 1975.

----- HELIOS-B, KUNDT -----

INVESTIGATION NAME- CELESTIAL MECHANICS

NSBDC ID- 76-003A-14 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
CELESTIAL MECHANICS  
ASTRONOMY

PERSONNEL

PI - W. KUNDT	U OF HAMBURG
OI - W.G. MELBOURNE	NASA-JPL

BRIEF DESCRIPTION

THIS EXPERIMENT USED THE TRACKING DATA TO OBTAIN A DETAILED SPACECRAFT ORBIT AND TO OBTAIN IMPROVED KNOWLEDGE OF THE ORBITAL ELEMENTS OF THE EARTH-MOON SYSTEM AND GENERAL RELATIVITY PARAMETERS.

----- HELIOS-B, KUNOW -----

INVESTIGATION NAME- COSMIC-RAY PARTICLES

NSBDC ID- 76-003A-07 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - H. KUNOW	U OF KIEL
OI - G.H. WIDBERGENZ	U OF KIEL
OI - G. GREEN	U OF KIEL
OI - H. MUELLER-MELLIN	U OF KIEL
OI - H. WITTE	U OF KIEL
OI - H. HEMPE	U OF KIEL

BRIEF DESCRIPTION

THE OBJECTIVE OF THE EXPERIMENT (E6) WAS TO STUDY HIGH-ENERGY, CHARGED, COSMIC-RAY PARTICLES OF SOLAR, PLANETARY, AND GALACTIC ORIGIN IN INTERPLANETARY SPACE. PROTONS AND ALPHA PARTICLES WITH ENERGIES  $\geq$  1.3 MEV/NUCLEON, AND ELECTRONS  $\geq$  0.3 MEV WERE MEASURED WITHIN INTERPLANETARY SPACE OVER THE RANGE FROM 0.3 TO 1.0 AU. THE INSTRUMENT, A PARTICLE TELESCOPE WITH A 50-DEG FIELD OF VIEW, CONSISTED OF FIVE SEMICONDUCTOR DETECTORS, ONE SAPPHIRE CERENKOV COUNTER, AND ONE SCINTILLATION COUNTER, ALL ENCLOSED BY AN ANTICOINCIDENCE CYLINDER. THE TELESCOPE WAS CALIBRATED PRIOR TO LAUNCH USING RADIOACTIVE SOURCES, PARTICLE ACCELERATORS, AND GROUND-LEVEL MUONS. IT MEASURED PROTONS AND ALPHA PARTICLES IN SIX CHANNELS (1.3-3.5, 3.5-15, 15-27, 27-57, 57-45, AND  $\geq$  45 MEV/NUCLEON) AND ELECTRONS IN FIVE ENERGY CHANNELS (0.3-0.8, 0.8-2, 2-5, 5-4, AND  $\geq$  4 MEV). FOR MORE DETAIL SEE PP 253-257 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPTEMBER/OCTOBER 1975.

----- HELIOS-B, LEINERT -----

INVESTIGATION NAME- ZODIACAL LIGHT PHOTOMETER

NSBDC ID- 76-003A-11 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY PHYSICS  
ZODIACAL LIGHT

PERSONNEL

PI - C. LEINERT	RPI-AERONOMY
OI - E. PITZ	RPI-AERONOMY

BRIEF DESCRIPTION

THIS EXPERIMENT (E9) CONSISTED OF THREE PHOTOMETERS LOOKING AT 15 DEG, 30 DEG, AND 90 DEG FROM THE ECLIPTIC. THESE PHOTOMETERS OBSERVED THE INTENSITY AND POLARIZATION OF THE ZODIACAL LIGHT IN UV, BLUE, SELECTED VISUAL BANDS, AND WHITE LIGHT. THE PURPOSE OF THIS EXPERIMENT WAS TO OBTAIN INFORMATION ABOUT THE SPATIAL DISTRIBUTION, SIZE, AND NATURE OF INTERPLANETARY DUST PARTICLES. FOR FURTHER DETAILS, SEE PP 264-267 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPT./OCT. 1975.

----- HELIOS-B, NESS -----

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS

NSBDC ID- 76-003A-02 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - H.F. NESS	NASA-GSFC
OI - F. MARIANI	U OF BIRMINGHAM
OI - L.F. BURLAGA	NASA-GSFC
OI - S.C. CANTARANO	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

THIS EXPERIMENT (E3) CONSISTED OF A BOOM-MOUNTED TRIAXIAL-FLUXGATE MAGNETOMETER. AN AUTOMATIC IN-FLIGHT RANGE SWITCH SYSTEM SELECTED THE OPTIMUM OF FOUR RANGES THAT ARE PLUS TO PLUS 16, 40, 144, AND 432 NT PER SENSOR. THESE HAD CORRESPONDING DIGITIZATION RESOLUTIONS OF MINUS TO PLUS 0.03, 0.09, 0.28, AND 0.84 NT. A SENSOR FLIPPER WAS ACTUATED EVERY 36 H TO ASSIST IN SENSOR ZERO LEVEL DETERMINATION. FOR TELEMETRY BIT RATES ABOVE 256 BPS, VECTOR MEASUREMENTS WERE MADE AT RATES BETWEEN 1 AND 16 PER S, DEPENDING ON BIT RATES. AT LOWER BIT RATES, AVERAGES AND VARIANCES WERE COMPUTED ON BOARD FOR TRANSMISSION TO EARTH. FOR FURTHER DETAILS, SEE PP 237-240 OF "RAUMFAHRTFORSCHUNG," 19, 5, SEPT./OCT. 1975.

----- HELIOS-B, NEUBAUER -----

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS

NSBDC ID- 76-003A-01 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - F.M. NEUBAUER	BRAUNSCHWEIG TECH U
OI - A. PAIER	BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

THE INSTRUMENT (E2) CONSISTED OF A TRIAXIAL FLUXGATE MAGNETOMETER MOUNTED ON A 2.75-M BOOM TO MAKE MAGNETIC FIELD MEASUREMENTS UP TO 4 Hz. DATA FROM EACH AXIS WERE FIRST SENT THROUGH A LOW-PASS FILTER WITH THE 3 DB ATTENUATION POINT AT 4 Hz. DEPENDING ON THE TELEMETRY FORMAT AND BIT RATE, THE DATA WERE FEED EITHER INTO A TIME-AVERAGING COMPUTER OR DIRECTLY CONNECTED TO TELEMETRY. A SHOCK IDENTIFICATION COMPUTER TRIGGERED THE STORAGE OF RAPID RATE DATA IN THE SPACECRAFT MEMORY WHEN THERE WERE DISCONTINUITIES IN THE VARIATIONS OF THE AMBIENT MAGNETIC FIELD. TWO MEASUREMENT RANGES WERE USED, PLUS OR MINUS 100 AND 400 NT WITH RESOLUTIONS OF PLUS OR MINUS 0.2 AND 0.8 NT, RESPECTIVELY. THE INSTRUMENT WAS EQUIPPED WITH A FLIPPER MECHANISM, WHICH RE-ORIENTED EACH SENSOR BY 90 DEG PERIODICALLY. FOR DETAILED INFORMATION, SEE P 252 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-B, NEUBAUER -----

INVESTIGATION NAME- SEARCH COIL MAGNETOMETER

NSBDC ID- 76-003A-03 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

**PERSONNEL**

PI - F.R. NEUDAUER  
OI - G. DENNELL

BRAUNSCHWEIG TECH U  
BRAUNSCHWEIG TECH V

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E6) WAS DESIGNED TO INVESTIGATE THE MAGNETIC COMPONENT OF ELECTROMAGNETIC WAVES IN THE SOLAR WIND FROM 0.3 TO 1.0 AU. BY MEANS OF ITS WAVEFORM CHANNEL (WFC), THE RAPID VARIATIONS OF THE MAGNETIC FIELD WERE MEASURED UP FROM PLUS OR MINUS 8.75 NT TO PLUS OR MINUS 275 NT IN THREE ORTHOGONAL DIRECTIONS FROM 4 TO 128 Hz. A SPECTRUM ANALYZER OBSERVED THE FIELD COMPONENTS IN THE ECLIPSTIC PLANE AND PERPENDICULAR TO IT, TO OBTAIN THE POWER SPECTRAL DENSITY AND PEAK VALUES FOR EIGHT LOGARITHMICALLY SPACED CHANNELS IN THE RANGE FROM 4.7 TO 2200 Hz. BECAUSE OF THE LARGE AMOUNT OF DATA PRODUCED BY THIS EXPERIMENT, AN ADAPTIVE DATA REDUCTION WAS APPLIED. FOR INTERESTING TIME INTERVALS SELECTED BY THE FLUIGATE MAGNETOMETER (NEUDAUER) 76-003A-01, OR BURNETT (-02), WAVEFORM DATA COULD BE READ INTO AN ON-BOARD MEMORY AT A RAPID RATE TO BE TRANSMITTER SLOWLY AFTERWARDS. FOR MORE DETAILED INFORMATION SEE P 241 IN "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-B, ROSENBAUER -----

**INVESTIGATION NAME- PLASMA DETECTORS**

NSSDC ID- 76-003A-09

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS**PERSONNEL**

PI - H.R. ROSENBAUER  
OI - H. PELKOFER  
OI - J.H. WOLFE

MPG-AERONOMY  
MPG-EXTRATERR PHYS  
NASA-ARC

**BRIEF DESCRIPTION**

THIS EXPERIMENT (E1) EMPLOYED THREE PLASMA ANALYZERS FOR POSITIVE IONS AND ONE FOR ELECTRONS. ALL DETECTORS WERE MOUNTED NORMAL TO THE SPIN AXIS. POSITIVE IONS WITH ENERGY PER CHARGE WITHIN THE RANGE 0.195 TO 15.32 KEV/e WERE MEASURED IN TWO ANGULAR DIMENSIONS USING A COMBINATION OF A HEMISPHERICAL, A QUADRISPERICAL, AND A SINUSOIDALLY SHAPED ELECTROSTATIC ANALYZER. ELECTRONS WITH ENERGY FROM 0.5 TO 1600 EV WERE MEASURED WITH A HEMISPHERICAL ELECTROSTATIC ANALYZER IN ONE DIMENSION. THE EXPERIMENT OPERATED IN SEVERAL MODES WITH DIFFERENT TIME RESOLUTION DEPENDING IN DETAIL ON TELEMETRY FORMAT AND SATELLITE BIT RATE. TYPICAL TIME RESOLUTION WAS ON THE ORDER OF A MINUTE. ALSO, WHENEVER THE SPECIAL SHOCK ALARM MODE WAS TRIGGERED BY EXPERIMENTS -04 OR -05, HIGH TIME RESOLUTION PLASMA DATA FOR A PERIOD STARTING BEFORE AND ENDING AFTER THE EVENT WERE RECORDED INTO SPACECRAFT MEMORY FOR LATER TRANSMISSION. BECAUSE THE SPACECRAFT BODY WAS COATED WITH A CONDUCTIVE COATING, THE SHEATH POTENTIALS WERE ABOUT 5 EV, CAUSING FAR LESS DEGRADATION IN THE USEFULNESS OF DATA TAKEN IN THE LOWER ELECTRON ENERGY CHANNELS THAN ON THE HELIOS-A SPACECRAFT, AND ALMOST NO EFFECT ON THE ION DATA. FOR MORE DETAILED INFORMATION SEE P 226 OF "RAUMFAHRTFORSCHUNG," 19, 5, 1975.

----- HELIOS-B, TRAINOR -----

**INVESTIGATION NAME- GALACTIC AND SOLAR COSMIC RAYS**

NSSDC ID- 76-003A-08

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
COSMIC RAYS**PERSONNEL**

PI - J.H. TRAINOR  
OI - E.C. ROEOF  
OI - D.J. TEEGARDEN  
OI - F.B. MCDONALD  
OI - K.G. McCracken

NASA-GSFC  
APPLIED PHYSICS LAB  
NASA-GSFC  
NASA-GSFC  
CSIRO

**BRIEF DESCRIPTION**

THE DETECTOR COMPLEMENT OF THIS EXPERIMENT (E7) CONSISTED OF THREE SEPARATE DELTA E/DELTA N VS E TELESCOPES AND A PROPORTIONAL COUNTER FOR MONITORING SOLAR X-RAYS IN THE RANGE 2-8 KEV. THE HIGH ENERGY TELESCOPE HAD A GEOMETRIC FACTOR OF 0.22 SQ CM-SR AND MEASURED ELECTRONS IN THREE RANGES BETWEEN 2 AND 8 MEV, AND PROTONS AND ALPHA PARTICLES IN THREE RANGES BETWEEN 20 AND 56 MEV/n. PROTONS ABOVE 230 MEV WERE ALSO MEASURED. THE FIRST LOW-ENERGY TELESCOPE (GEOMETRIC FACTOR WAS 0.195 SQ CM-SR) MEASURED PROTONS AND 2.67, 1 PARTICLES IN THREE RANGES BETWEEN 3 AND 21 MEV/n. THE SECOND LOW-ENERGY TELESCOPE (GEOMETRIC FACTOR WAS 0.015 SQ CM-SR) MEASURED PROTONS IN SEVERAL RANGES BETWEEN 0.12 AND 2.1 MEV, ALPHA PARTICLES IN THE RANGES 0.6-2.1 AND 6-21.2 MEV/n, AND ELECTRONS IN FOUR RANGES BETWEEN 0.12 AND 2 MEV. FOR A NUMBER OF COINCIDENCE MODES, COUNTING DATA SECTORED INTO EIGHT 45 DEG SECTORS WERE OBTAINED. THE DATA CYCLE TIME WAS DEPENDENT ON THE SPACECRAFT TELEMETRY RATE (VARIABLE BETWEEN 4096 AND 8 BITS/S) AND FORMAT. UNDER OPTIMUM CONDITIONS, FIVE EVENTS PER SECOND ARE PULSE HEIGHT ANALYZED AND THE RATE DATA CYCLE WAS ON THE ORDER OF 5 MINUTES. AT THE SLOWEST COMBINATION OF BIT RATE AND FORMAT, A COMPLETE DATA CYCLE REQUIRED ABOUT 2.5 HOURS. FOR FURTHER DETAILS SEE "IEEE TRANS. ON NUC. SCI." NS-22, 578, 1975, AND PP 258-260 OF "RAUMFAHRTFORSCHUNG," 19, 5 SEPT/OCT, 1975.

----- IMP-J, DARE -----

SPACECRAFT COMMON NAME- IMP-J  
ALTERNATE NAMES- PL-728A, IMP 8  
EXPLORER 80, 683

NSSDC ID- 73-078A  
LAUNCH DATE- 10/26/73  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 17286. MIN  
PERIAPELIS- 141224. KM ALT  
EPOCH DATE- 10/29/73  
INCLINATION- 28.7 DEG  
APOPELIS- 288940. KM ALT

PERSONNEL  
RG - J.R. KOLTZ  
SC - E.R. SCHMERLING  
PM - R.A. DAVIS  
PS - J.H. KING  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
IMP 8 (EXPLORER 80), THE LAST SATELLITE OF THE IMP SERIES, WAS A DROM-SHAPED SPACECRAFT, 135.6 CM ACROSS AND 187.4 CM HIGH, INSTRUMENTED FOR INTERPLANETARY AND MAGNETOTAIL STUDIES OF COSMIC RAYS, ENERGETIC SOLAR PARTICLES, PLASMA, AND ELECTRIC AND MAGNETIC FIELDS. ITS INITIAL ORBIT WAS MORE ELLIPTICAL THAN INTENDED, WITH APOGEE AND PERIGEE DISTANCES OF ABOUT 45 AND 25 EARTH RADII. ITS ECCENTRICITY DECREASED AFTER LAUNCH. THE SPACECRAFT SPIN AXIS WAS NORMAL TO THE ECLIPSTIC PLANE, AND THE SPIN RATE WAS 23 RPM. THE DATA TELEMETRY RATE WAS 1600 DPS.

----- IMP-J, AGGSON -----

**INVESTIGATION NAME- ELECTROSTATIC FIELDS**

NSSDC ID- 73-078A-11

INVESTIGATIVE PROGRAM  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL  
PI - T.L. AGGSON  
OI - J.P. HEPPNER  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
THE INSTRUMENT WAS DESIGNED TO MEASURE AMBIENT ELECTRIC FIELDS IN THE SOLAR WIND AND THE EARTH'S MAGNETOSHEATH UP TO 1 kHz IN FREQUENCY. THE SENSOR CONSISTED OF A PAIR OF 70-M WIRE ANTENNAS (100 M, TIP-TO-TIP), WHICH WERE HELD RIGID BY CENTRIFUGAL FORCE DUE TO SATELLITE SPIN (ABOUT 24 RPM). THE WIRES WERE INSULATED FROM THE PLASMA, EXCEPT FOR THEIR SHORT OUTER SECTIONS, TO REMOVE THE ACTIVE PROBE AREA FROM THE SPACECRAFT SHEATH. THE ANTENNA SERVED AS A DOUBLE FLOATING PROBE, AND MEASUREMENTS WERE OBTAINED EVERY 1/4 SPACECRAFT REVOLUTION (ABOUT 0.75 S). ULF AND VLF MEASUREMENTS WERE OBTAINED USING SEVEN 60 PERCENT BANDWIDTH FILTERS WITH CENTER FREQUENCIES LOGARITHMICALLY SPACED FROM 1 Hz TO 1 kHz. THESE FREQUENCY CHANNELS HAD AN INTRINSIC SENSITIVITY OF 1.0E-5 V/M, AND A PEAK RANGE OF 1.0E-2 V/M. HOWEVER, THE EFFECTIVE LOW-FREQUENCY FILTER THRESHOLD WAS DETERMINED BY INTERFERENCE DUE TO HARMONICS OF THE SPACECRAFT SPINNING WITHIN AN ASYMMETRIC SHEATH. THE OTHER MAJOR LIMITATION WAS ALSO DUE TO SHEATH EFFECT. WHENEVER THE ELECTRON PLASMA DENSITY WAS LESS THAN ABOUT 10 PARTICLES/CU CM, THE SHEATH OVERLAPPED THE ACTIVE ANTENNA PORTIONS AND PRECLUDED MEANINGFUL MEASUREMENTS OF AMBIENT CONDITIONS.

----- IMP-J, DARE -----

**INVESTIGATION NAME- SOLAR PLASMA ELECTROSTATIC ANALYZER**

NSSDC ID- 72-078A-10

INVESTIGATIVE PROGRAM  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
SOLAR PHYSICS

PERSONNEL  
PI - S.J. DARE  
OI - J.R. ASBRIDGE  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION  
A HEMISPHERICAL ELECTROSTATIC ANALYZER MEASURED THE DIRECTIONAL INTENSITY OF POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND, MAGNETOSHEATH, AND MAGNETOTAIL. IONS AS HEAVY AS OXYGEN WERE RESOLVED WHEN THE SOLAR WIND TEMPERATURE WAS LOW. ENERGY ANALYSIS WAS ACCOMPLISHED BY CHARGING THE PLATES TO KNOWN VOLTAGE LEVELS AND ALLOWING THEM TO DISCHARGE WITH KNOWN TIME CONSTANTS. IN THE SOLAR WIND, POSITIVE IONS FROM 200 EV

TO 3 KEV (15 PERCENT SPACING, 3 PERCENT RESOLUTION) AND ELECTRONS FROM 3 EV TO 1 KEV (10 PERCENT SPACING, 10 PERCENT RESOLUTION) WERE STUDIED. IN THE MAGNETOSHEATH, POSITIVE IONS FROM 200 EV TO 9 KEV (10 PERCENT SPACING, 3 PERCENT RESOLUTION) AND FROM 200 EV TO 20 KEV (10 PERCENT SPACING, 10 PERCENT RESOLUTION) AND ELECTRONS FROM 3 EV TO 1 KEV (10 PERCENT SPACING, 10 PERCENT RESOLUTION) WERE STUDIED. IN THE MAGNETOTAIL, POSITIVE IONS FROM 200 EV TO 20 KEV (10 PERCENT SPACING, 10 PERCENT RESOLUTION) AND ELECTRONS FROM 3 EV TO 1 KEV (10 PERCENT SPACING, 10 PERCENT RESOLUTION) AND FROM 100 EV TO 20 KEV (10 PERCENT RESOLUTION) WERE STUDIED.

----- IMP-J, BRIDGE-----

INVESTIGATION NAME- SOLAR PLASMA FARADAY CUP

NSSDC ID- 73-078A-02

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - H.S. BRIDGE  
OI - A.J. LAZARUS  
OI - J.H. DINACK  
OI - E.F. LYON

MASS INST OF TECH  
MASS INST OF TECH  
MASS INST OF TECH  
MASS INST OF TECH

BRIEF DESCRIPTION

A MODULATED SPLIT-COLLECTOR FARADAY CUP, PERPENDICULAR TO THE SPACECRAFT SPIN AXIS, WAS USED TO STUDY THE DIRECTIONAL INTENSITY OF POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND, TRANSITION REGION, AND MAGNETOTAIL. ELECTRONS WERE STUDIED IN EIGHT LOGARITHMICALLY EQUISPACED ENERGY CHANNELS BETWEEN 1 EV AND 7 KEV. POSITIVE IONS WERE STUDIED IN EIGHT CHANNELS BETWEEN 50 EV AND 7 KEV. A SPECTRUM WAS OBTAINED EVERY EIGHT SPACECRAFT REVOLUTIONS. ANGULAR INFORMATION WAS OBTAINED IN EITHER 15 EQUALLY SPACED INTERVALS DURING A 360-DEG REVOLUTION OF THE SATELLITE OR IN 15 ANGULAR SEGMENTS CENTERED MORE CLOSELY ABOUT THE SPACECRAFT SUN LINE.

----- IMP-J, FRANK-----

INVESTIGATION NAME- MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 73-078A-04

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - L.A. FRANK

U OF IOWA

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO MEASURE THE ENERGY SPECTRA OF LOW-ENERGY ELECTRONS AND PROTONS IN THE GEOCENTRIC RANGE 30 TO 40 R(E) TO GIVE FURTHER DATA ON GEOMAGNETIC STORMS, AURORA, TAIL AND NEUTRAL SHEETS, AND OTHER MAGNETOSPHERIC PHENOMENA. THE DETECTOR WAS A DUAL-CHANNEL CURVED-PLATE ELECTROSTATIC ANALYZER (LEPEDEA - LOW ENERGY PROTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER) WITH 16 ENERGY INTERVALS BETWEEN 5 EV AND 50 KEV. IT HAD AN ANGULAR FIELD OF VIEW OF 9 DEG BY 25 DEG. THE DETECTOR COULD BE OPERATED IN ONE OF TWO MODES -- (1) ONE PROVIDING GOOD ANGULAR RESOLUTION (16 DIRECTIONS FOR EACH PARTICLE ENERGY BAND) ONCE EACH 272 S, AND (2) ONE PROVIDING GOOD TEMPORAL RESOLUTION IN WHICH THE ENTIRE ENERGY RANGE IN FOUR DIRECTIONS WAS MEASURED EVERY 64 S.

----- IMP-J, GLOECKLER-----

INVESTIGATION NAME- SOLID-STATE DETECTORS

NSSDC ID- 73-078A-05

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SCALAR PHYSICS

PERSONNEL

PI - G. GLOECKLER  
OI - C.V. FAN  
OI - D.R. HOVESTADT

U OF MARYLAND  
U OF ARIZONA  
MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO DETERMINE THE COMPOSITION AND ENERGY SPECTRA OF LOW-ENERGY PARTICLES OBSERVED DURING SOLAR FLARES AND 27-DAY RECURRENT EVENTS. THE DETECTORS USED INCLUDE (1) AN ELECTROSTATIC ANALYZER (TO SELECT PARTICLES OF THE DESIRED ENERGY PER CHARGE) COMBINED WITH AN ARRAY OF WINDOWLESS SOLID-STATE DETECTORS (TO MEASURE THE ENERGY LOSS) AND SURROUNDED BY AN ANTICOINCIDENCE SHIELDING, AND (2) A THIN WINDOW PROPORTIONAL COUNTER, SOLID-STATE PARTICLE TELESCOPE. THE EXPERIMENT MEASURED PARTICLE ENERGIES FROM 0.1 TO 10 MEV PER CHARGE IN 12 BANDS AND UNIQUELY IDENTIFIED POSITRONS AND ELECTRONS AS WELL AS NUCLEI WITH CHARGES OF Z FROM 1 TO 8 (INC CHARGE RESOLUTION FOR Z GREATER THAN 8). TWO 1000-CHANNEL PULSE HEIGHT ANALYZERS, ONE FOR EACH DETECTOR, WERE INCLUDED IN THE EXPERIMENT PAYLOAD.

----- IMP-J, GURNETT-----

INVESTIGATION NAME- ELECTROSTATIC WAVES AND RADIO NOISE

NSSDC ID- 73-078A-12

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - B.A. GURNETT  
OI - T.L. AGGSON  
OI - G.W. PREIFFER

U OF IOWA  
NASA-GSFC  
U OF IOWA

BRIEF DESCRIPTION

A WIDE-BAND RECEIVER WAS USED TO OBSERVE HIGH-RESOLUTION FREQUENCY-TIME SPECTRA, AND A SIR-CHANNEL NARROW-BAND RECEIVER WITH A VARIABLE CENTER FREQUENCY WAS USED TO OBSERVE WAVE CHARACTERISTICS. THE RECEIVERS OPERATED FROM THREE ANTENNA SYSTEMS. THE FIRST SYSTEM CONTAINED A PAIR OF LONG DIPOLE ANTENNAS (ONE, EXTENDABLE TO ABOUT 124 M, NORMAL TO THE SPACECRAFT SPIN AXIS AND THE OTHER ANTENNA, EXTENDABLE TO ABOUT 6.1 M, ALONG THE SPIN AXIS). THE SECOND SYSTEM CONTAINED A DOOR-MOUNTED TRIAD OF ORTHOGONAL LOOP ANTENNAS. THE THIRD SYSTEM CONSISTED OF A DOOR-MOUNTED .51 M (20 IN.) SPIN AXIS DIPOLE. THE MAGNETIC AND ELECTRIC FIELD INTENSITIES AND FREQUENCY SPECTRA, POLARIZATION, AND DIRECTION OF ARRIVAL OF NATURALLY OCCURRING RADIO NOISE IN THE MAGNETOSPHERE WERE OBSERVED. PHENOMENA STUDIED WERE THE TIME-SPACE DISTRIBUTION, ORIGIN, PROPAGATION, DISPERSION, AND OTHER CHARACTERISTICS OF RADIO NOISES OCCURRING ACROSS AND ON EITHER SIDE OF THE MAGNETOSPHERIC BOUNDARY REGION. THE FREQUENCY RANGE FOR ELECTRIC FIELDS WAS 0.5 Hz TO 200 KHz, AND FOR MAGNETIC FIELDS IT WAS 20 Hz TO 200 KHz.

----- IMP-J, KRIMIGIS-----

INVESTIGATION NAME- CHARGED PARTICLE MEASUREMENTS  
EXPERIMENT

NSSDC ID- 73-078A-08

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS

PERSONNEL

PI - S.M. KRIMIGIS  
OI - T.P. ARMSTRONG  
OI - J.A. VAN ALLEN

APPLIED PHYSICS LAB  
U OF KANSAS  
U OF IOWA

BRIEF DESCRIPTION

THREE SOLID-STATE DETECTORS IN AN ANTICOINCIDENCE PLASTIC SCINTILLATOR OBSERVED ELECTRONS BETWEEN 0.2 AND 2.5 MEV, PROTONS BETWEEN 0.5 AND 500 MEV, ALPHA PARTICLES BETWEEN 2.0 AND 200 MEV, HEAVY PARTICLES WITH Z VALUES RANGING FROM 2 TO 5 WITH ENERGIES GREATER THAN 8 MEV, HEAVY PARTICLES WITH Z VALUES RANGING BETWEEN 6 AND 8 WITH ENERGIES GREATER THAN 27 MEV, AND INTEGRAL PROTONS AND ALPHAS OF ENERGIES GREATER THAN 50 MEV/NUCLEON, ALL WITH DYNAMIC RANGES OF 1 TO 1 MILLION (PER 50 CM<sup>2</sup> SR). FIVE THIN-WINDOW GEIGER-MUELLER TUBES OBSERVED ELECTRONS OF ENERGY GREATER THAN 15 KEV, PROTONS OF ENERGY GREATER THAN 250 KEV, AND X-RAYS WITH WAVELENGTHS BETWEEN 2 AND 10 Å, ALL WITH A DYNAMIC RANGE OF 10 TO 100 MILLION (PER 50 CM<sup>2</sup> SR). PARTICLES AND X-RAYS PRIMARILY OF SOLAR ORIGIN WERE STUDIED, BUT THE DYNAMIC RANGE AND RESOLUTION OF THE INSTRUMENT PERMITTED OBSERVATION OF COSMIC RAYS AND MAGNETOTAIL PARTICLES.

----- IMP-J, MCDONALD-----

INVESTIGATION NAME- SOLAR AND COSMIC-RAY PARTICLES

NSSDC ID- 73-078A-09

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS  
COSMIC RAYS

PERSONNEL

PI - F.B. McDONALD  
OI - D.E. MAGGE  
OI - B.J. TEEGARDEN

NASA-GSFC  
UNKNOWN  
NASA-GSFC

BRIEF DESCRIPTION

THE GSFC COSMIC-RAY EXPERIMENT WAS DESIGNED TO MEASURE ENERGY SPECTRA, COMPOSITION, AND ANGULAR DISTRIBUTIONS OF SOLAR AND GALACTIC ELECTRONS, PROTONS, AND HEAVIER NUCLEI UP TO Z = 30. THREE DISTINCT DETECTOR SYSTEMS WERE USED. THE FIRST SYSTEM CONSISTED OF A PAIR OF SOLID-STATE TELESCOPES THAT MEASURED INTEGRAL FLUXES OF ELECTRONS ABOVE 150, 350, AND 700 KEV AND OF PROTONS ABOVE .05, .15, .50, 1.70, 1.0, 1.2, 2.0, 2.5, 5.0, 15, AND 25 MEV, EXCEPT FOR THE 105-MEV PROTON MODE. ALL COUNTING MODES HAD UNIQUE SPECIES IDENTIFICATION. THE SECOND DETECTOR SYSTEM WAS A SOLID-STATE DEPDIX VS E TELESCOPE THAT LOOKED PERPENDICULAR TO THE SPIN AXIS. THIS TELESCOPE MEASURED Z = 1 TO 16 NUCLEI WITH ENERGIES BETWEEN 4 AND 20 MEV/NUCLEON. COUNTS OF PARTICLES IN THE 0.5- TO 6-MEV/NUCLEON RANGE, WITH NO CHARGE RESOLUTION, WERE OBTAINED AS COUNTS IN THE DEPDIX BUT NOT IN THE E SENSOR. THE THIRD DETECTOR SYSTEM



## SPONSORING COUNTRY/AGENCY

U.S.S.R.

INTERCOS

## INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 99.8 MIN  
PERIAPSIS- 902. KM ALT

EPOCH DATE- 02/28/79  
INCLINATION- 74. DEG  
APOAPSIS- 966. KM ALT

## PERSONNEL

PS - V.V. MIGULIN

IZMIRAN

## BRIEF DESCRIPTION

DURING THE INTERNATIONAL MAGNETOSPHERE STUDY PERIOD AN INTERCOSMOS SPACECRAFT, IONOSONDE-IK, WAS LAUNCHED INTO A HIGH INCLINATION ELLIPTICAL ORBIT WITH A LOW APOGEE. THE MAIN SCIENTIFIC OBJECTIVES OF IONOSONDE-IK WERE (1) THE STUDY OF ELECTRON DENSITY DISTRIBUTION FROM THE MAIN IONIZATION MAXIMUM OF F REGION UP TO THE SATELLITE ALTITUDE WITH A TOP SIDE SOUNDER, AND THE CORRELATION OF THE TIME AND SPACE VARIATIONS WITH SOLAR ACTIVITY, CORPUSCULAR FLUXES AND OTHER GEOPHYSICAL PHENOMENA; (2) GLOBAL MAPPING OF BASIC IONOSPHERIC PARAMETERS AND CONSTRUCTION OF A TOP-SIDE IONOSPHERE MODEL; (3) THE STUDY OF WAVE PROCESSES IN MAGNETOSPHERIC PLASMA IN THE FREQUENCY RANGE 100 Hz TO 5 MHz; (4) THE STUDY OF TIME AND SPACE VARIATIONS OF EMISSIONS IN THE 6300-6364 Å BANDS AND 3914 Å AND 9577 Å LINES; (5) THE STUDY OF TIME AND SPACE VARIATIONS OF CHARGED PARTICLES WITH ENERGIES BETWEEN 10 EV AND 50 MEV AND THEIR IONOSPHERIC EFFECTS; AND (6) THE STUDY OF TIME AND SPACE VARIATIONS OF LOCAL ELECTRON AND ION DENSITIES AND TEMPERATURES. THE PROGRAM INCLUDES SIMULTANEOUS GROUND-BASED OBSERVATIONS AT IONOSPHERIC AND SOLAR STATIONS OF THE USSR AND SOCIALIST COUNTRIES. EXPERIMENT INFORMATION NOT SUPPLIED.

\*\*\*\*\* ISEE 1, BARE \*\*\*\*\*

## SPACECRAFT COMMON NAME- ISEE 1

ALTERNATE NAMES- IMP-K, 10422

MOTHER, INT'L SUN-EARTH EXPL-A  
ISEE-A

NSSDC ID- 77-102A

LAUNCH DATE- 10/22/77  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

WEIGHT- 340.2 KG

## SPONSORING COUNTRY/AGENCY

UNITED STATES

NASA-GSFC

## INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 3496.4 MIN  
PERIAPSIS- 281. KM ALT

EPOCH DATE- 10/23/77  
INCLINATION- 28.7 DEG  
APOAPSIS- 138120. KM ALT

## PERSONNEL

MG - J.P. CORRIGAN  
SC - E.R. SCHMERLING  
PM - R.O. WALES  
PS - K.H. OGILVIE

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

## BRIEF DESCRIPTION

THE EXPLORER CLASS MOTHER SPACECRAFT WAS PART OF THE MOTHER/DAUGHTER/HELIOCENTRIC MISSION (ISEE A, B, AND C). THE PURPOSES OF THE MISSION WERE--(1) TO INVESTIGATE SOLAR/TERRESTRIAL RELATIONSHIPS AT THE OUTERMOST BOUNDARIES OF THE EARTH'S MAGNETOSPHERE; (2) TO EXAMINE IN DETAIL THE STRUCTURE OF THE SOLAR WIND NEAR THE EARTH AND THE SHOCK WAVE THAT FORMS THE INTERFACE BETWEEN THE SOLAR WIND AND EARTH; (3) TO CONTINUE THE INVESTIGATION OF COSMIC RAYS AND SOLAR FLARES IN THE INTERPLANETARY REGION NEAR 1 AU. THE MISSION THUS EXTENDED THE INVESTIGATIONS OF PREVIOUS IMP SPACECRAFT. THE MOTHER/DAUGHTER PORTION OF THE MISSION CONSISTED OF TWO SPACECRAFT WITH A STATION-KEEPING CAPABILITY IN A HIGHLY ECCENTRIC EARTH ORBIT WITH APOGEE TO 23 EARTH RADII. THE SPACECRAFT MAINTAINED A SMALL SEPARATION DISTANCE, AND MADE SIMULTANEOUS COORDINATED MEASUREMENTS TO PERMIT SEPARATION OF SPATIAL FROM TEMPORAL IRREGULARITIES IN THE NEAR-EARTH SOLAR WIND, THE BOW SHOCK, AND INSIDE THE MAGNETOSPHERE. THE SPIN RATE WAS SET AT 19.75 RPM, DIFFERING SLIGHTLY FROM THE ISEE-B SPACECRAFT. FOR INSTRUMENT DESCRIPTIONS WRITTEN BY THE INVESTIGATORS, SEE IEEE TRANSACTIONS ON GEOSCIENCE ELECTRONICS, VOL. GE-16, NO. 3, JULY, 1978.

\*\*\*\*\* ISEE 1, ANDERSON \*\*\*\*\*

## INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102A-10

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

## PERSONNEL

PI - K.A. ANDERSON  
OI - C.I. MENG  
OI - F.V. CORONITI  
OI - J.M. BOSQUED  
OI - R. PELLAT  
OI - G.K. PARKS  
OI - R.P. LIN  
OI - H. REENE

U OF CALIF, BERKELEY  
APPLIED PHYSICS LAB  
U OF CALIF, LA  
CESR  
CTR FOR THEORETIC PHYS  
U OF WASHINGTON  
U OF CALIF, BERKELEY  
CESR

## BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO DETERMINE, BY USING IDENTICAL INSTRUMENTATION ON THE MOTHER/DAUGHTER SPACECRAFT, THE SPATIAL EXTENT, PROPAGATION VELOCITY, AND TEMPORAL BEHAVIOR OF A WIDE VARIETY OF PARTICLE PHENOMENA. ELECTRONS WERE MEASURED AT 2 AND 6 KEV AND IN TWO BANDS: 8 TO 200 KEV AND 30 TO 200 KEV. PROTONS WERE MEASURED AT 2 AND 6 KEV AND IN THREE BANDS: 8 TO 200 KEV, 30 TO 200 KEV, AND 200 TO 380 KEV. THE 30 KEV THRESHOLD COULD BE COMMANDED TO 10 OR 60 KEV. IDENTICAL INSTRUMENTATION ON EACH SPACECRAFT CONSISTED OF A PAIR OF SURFACE BARRIER SEMICONDUCTOR DETECTOR TELESCOPES (ONE WITH A FOIL AND ONE WITHOUT A FOIL) AND FOUR FIXED-ENERGY ELECTRIC FIELD PARTICLE ANALYZERS. THE TELESCOPES HAD A VIEWING CONE WITH HALF ANGLE 40 DEG, ORIENTED AT ABOUT 20 DEG TO THE SPIN AXIS.

----- ISEE 1, BARE -----

## INVESTIGATION NAME- FAST PLASMA AND SOLAR WIND IONS

NSSDC ID- 77-102A-01

INVESTIGATIVE PROGRAM

CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS

## PERSONNEL

PI - S.J. BAME  
OI - H. MIGGENREIDER  
OI - K. SCHINDLER  
OI - J.R. ASBRIDGE  
OI - N.R. ROSENRAUER  
OI - H. VOLK  
OI - R.D. MONTGOMERY  
OI - G. PASCHMANN  
OI - W.C. FELDMAN  
OI - E.W. HONES, JR.

LOS ALAMOS SCI LAB  
MPI-EXTRATERR PHYS  
RUHR-U BOCHUM  
LOS ALAMOS SCI LAB  
MPI-AERONOMY  
MPI-NUCLEAR PHYS  
LOS ALAMOS SCI LAB  
MPI-EXTRATERR PHYS  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

## BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED, IN CONJUNCTION WITH A SIMILAR INSTRUMENT PROVIDED BY G. PASCHMANN OF MAX PLANCK INSTITUTE FOR FLIGHT ON THE DAUGHTER SPACECRAFT, TO STUDY THE PLASMA VELOCITY DISTRIBUTION AND ITS SPATIAL AND TEMPORAL VARIATIONS IN THE SOLAR WIND, BOW SHOCK, MAGNETOSHEATH, MAGNETOPAUSE, MAGNETOTAIL, AND MAGNETOSPHERE. PROTONS FROM 50 EV TO 40 KEV AND ELECTRONS FROM 5 EV TO 20 KEV WERE MEASURED IN ONE, TWO, AND THREE DIMENSIONS BY THREE 90-DEG SPHERICAL ELECTROSTATIC ANALYZERS. THE EXPERIMENT, WHICH UTILIZED CHANNELTRON ELECTRON MULTIPLIERS AS DETECTORS, OPERATED IN TWO RANGES, WITH ENERGY RESOLUTION FOR SEVERAL STEPS IN EACH RANGE OF 10 PERCENT OF THE CENTER ENERGY LEVEL.

----- ISEE 1, CLINE -----

## INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 77-102A-14

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
GAMMA-RAY ASTRONOMY

## PERSONNEL

PI - T.L. CLINE  
OI - D.K. HOVESTADT  
OI - B.J. TEEGANDEEN  
OI - G. GLOECKLER

NASA-GSFC  
MPI-EXTRATERR PHYS  
NASA-GSFC  
U OF MARYLAND

## BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO RECOGNIZE AND RECORD THE TIME HISTORY OF GAMMA-RAY BURSTS. TWO SENSORS WERE USED: A 4-CM DIAM CESIUM IODIDE SCINTILLATOR SYSTEM AND A 6-50 CM SOLID-STATE (CADMIUM TELLURIDE) ARRAY. AN INTENSITY INCREASE IN EITHER OF THE SENSORS COULD CAUSE A TRIGGER TO OCCUR, FREEZING THE CIRCULATING MEMORY OF THE IMMEDIATE PAST COUNTING RATE HISTORY AND FILLING ANOTHER MEMORY WITH THE COUNTING RATES FOR 1 MIN FOLLOWING THE TRIGGER. THE TIME OF THE TRIGGER AND ITS LOCATION IN THE TEMPORAL HISTORY WERE ALSO STORED IN MEMORY. ALL STORED INFORMATION WAS THEN READ OUT AT A VERY LOW BIT RATE DURING THE SUCCEEDING SEVERAL HOURS. THREE TRIGGERS WERE USED BASED ON TOTAL COUNTS IN 4 MS, 32 MS, AND 256 MS. SIX MEMORIES WERE USED, THREE BEFORE AND THREE AFTER THE TRIGGER, YIELDING STORAGE OF 1/64, 1/8, AND 1 MIN OF DATA EACH TO PROVIDE DETAILED RISE-TIME INFORMATION.

----- ISEE 1, FRANK -----

## INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102A-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS

**PERSONNEL**

PI - L.A. FRANK  
OI - V.M. VASYLIUNAS  
OI - C.F. KENNELL

U OF IOWA  
MPI-AERONOMY  
U OF CALIF. LA

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO STUDY, BY MEANS OF IDENTICAL INSTRUMENTATION ON THE MOTHER/DAUGHTER SPACECRAFT, THE SPATIAL AND TEMPORAL VARIATIONS OF THE SOLAR WIND AND MAGNETOSHEATH ELECTRONS AND IONS. PROTONS AND ELECTRONS IN THE ENERGY RANGE FROM 1 EV TO 45 KEV WERE MEASURED IN 64 CONTIGUOUS ENERGY BANDS WITH AN ENERGY RESOLUTION ( $\Delta E/E$ ) OF 0.16. A QUADRISPERIMETRIC LOW-ENERGY PROTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER (LEPEDEA), EMPLOYING SEVEN CONTINUOUS CHANNEL ELECTRON MULTIPLIERS IN EACH OF ITS TWO (ONE FOR PROTONS AND ONE FOR ELECTRONS) ELECTROSTATIC ANALYZERS WAS FLOWN ON BOTH MOTHER AND DAUGHTER SPACECRAFT. ALL BUT 2 PERCENT OF THE 4 PI-SR SOLID-ANGLE WAS COVERED FOR PARTICLE VELOCITY VECTORS. A GM TUBE WAS ALSO INCLUDED, WITH A CONICAL FIELD OF VIEW OF 40 DEG FULL ANGLE, PERPENDICULAR TO THE SPIN AXIS. THIS DETECTOR WAS SENSITIVE TO ELECTRONS WITH E GREATER THAN OR EQUAL TO 45 KEV, AND PROTONS WITH E GREATER THAN OR EQUAL TO 600 KEV.

**----- ISEE 1, GURNETT -----****INVESTIGATION NAME- PLASMA WAVES**

NSSDC ID- 77-102A-07

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - D.A. GURNETT  
OI - F.L. SCARF  
OI - R.W. FREDERICKS  
OI - E.J. SMITH

U OF IOWA  
TRW SYSTEMS GROUP  
TRW SYSTEMS GROUP  
NASA-JPL

**BRIEF DESCRIPTION**

THIS EXPERIMENT, IN CONJUNCTION WITH A SIMILAR (BUT SIMPLER) EXPERIMENT ON ISEE 2, WAS DESIGNED TO MEASURE WAVE PHENOMENA OCCURRING WITHIN THE MAGNETOSPHERE AND SOLAR WIND. THREE ELECTRIC DIPOLE ANTENNAS AND A TRIAXIAL SEARCH COIL ANTENNA WERE USED. THE INSTRUMENTATION CONSISTED OF FOUR MAIN ELEMENTS: (1) A NARROW-BAND SWEEP FREQUENCY RECEIVER WITH 32 FREQUENCY STEPS IN EACH OF FOUR BANDS FROM 100 Hz TO 400 kHz. A COMPLETE SWEEP REQUIRED 25 SEC; (2) A HIGH TIME RESOLUTION SPECTRUM ANALYZER WITH 20 CHANNELS FROM 5.62 Hz TO 312 kHz FOR ELECTRIC FIELD AND 14 IDENTICAL CHANNELS FROM 5.62 Hz TO 10 kHz FOR MAGNETIC FIELD INFORMATION. THE ELECTRIC AND MAGNETIC CHANNELS WERE SAMPLED SIMULTANEOUSLY; (3) A WAVE NORMAL ANALYZER TO PROVIDE COMPONENTS FOR COMPUTING THE WAVE NORMAL AND THE POINTING FLUX. THIS ANALYZER HAD A 10 Hz BANDWIDTH, AND COVERED 32 FREQUENCIES FROM 100 Hz TO 5 kHz; AND (4) A WIDE-BAND RECEIVER TO CONDITION ELECTRIC AND MAGNETIC WAVEFORMS FOR TRANSMISSION TO THE GROUND VIA THE SPECIAL-PURPOSE ANALOG TRANSMITTER. THIS RECEIVER ALSO PROVIDED THE SIGNALS FOR LONG BASELINE INTERFEROMETER MEASUREMENTS BETWEEN ISEE 1 AND ISEE 2. THERE WERE TWO BASIC FREQUENCY CHANNELS: 10 Hz TO 1 kHz AND 650 Hz TO 10 OR 40 kHz. IN ADDITION, THE FREQUENCY RANGE COULD BE SHIFTED BY A FREQUENCY CONVERSICK SCHEME TO ANY OF 8 RANGES UP TO 2 MHz.

**----- ISEE 1, HARVEY -----****INVESTIGATION NAME- PLASMA DENSITY**

NSSDC ID- 77-102A-08

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - C.C. HARVEY  
OI - M. PETIT  
OI - J.R. MCAFEE  
OI - D. JONES  
OI - J.M. ETCHETO  
OI - R.J.L. GRARD  
OI - R.E. GENDRIN

PARISS OBSERVATORY  
CNES  
NOAA-ERL  
ESA-ESTEC  
CNES  
ESA-ESTEC  
CNES

**BRIEF DESCRIPTION**

THIS EXPERIMENT MEASURED THE PLASMA ELECTRON DENSITY NEAR THE MOTHER SATELLITE AND ALSO THE TOTAL ELECTRON CONTENT BETWEEN THE MOTHER AND DAUGHTER SPACECRAFT. THE EXPERIMENT CONSISTED OF TWO DISTINCT PARTS -- (1) THE MOTHER SPACECRAFT THAT CARRIED AN EXPERIMENT (THE SOUNDER) TO DETECT RESONANCES OF THE AMBIENT PLASMA. AFTER AN ANTENNA HAD BEEN MOMENTARILY EXCITED AT ONE OF THE CHARACTERISTIC FREQUENCIES OF THE PLASMA IN WHICH IT WAS IMMersed, A PRONOUNCED 'RINGING' WAS OBSERVED. THESE RESONANCES OCCUR AT THE PLASMA FREQUENCY, THE UPPER HYBRID RESONANCE, THE CYCLOTRON FREQUENCY AND ITS HARMONICS, AND THE MEASUREMENT OF THEIR FREQUENCIES PERMITTED THE DETERMINATION OF SEVERAL PLASMA PARAMETERS, INCLUDING THE ELECTRON DENSITY. IN THIS EXPERIMENT, THE TRANSMITTER WAS DESIGNED TO STEP THROUGH 128 SUB-BANDS, COVERING THE CHARACTERISTIC RESONANCE FREQUENCIES OF THE PLASMA, FROM 0.3 TO 50.9 kHz, AND FROM 0 TO 353 kHz. (2) THE INTEGRATED DENSITY BETWEEN THE MOTHER AND THE DAUGHTER WAS OBTAINED FROM A SECOND

EXPERIMENT (THE PROPAGATION EXPERIMENT) THAT MEASURED THE PHASE DELAY INTRODUCED BY THE AMBIENT PLASMA ONTO A WAVE OF FREQUENCY ABOUT 683 kHz TRANSMITTED FROM THE MOTHER AND RECEIVED ON THE DAUGHTER (EXPERIMENT 6). THE PHASE WAS COMPARED AGAINST A PHASE-COHERENT SIGNAL TRANSMITTED FROM THE MOTHER TO THE DAUGHTER BY POPULATION ONTO A CARRIER OF FREQUENCY HIGH ENOUGH TO BE UNAFFECTED BY THE AMBIENT PLASMA (272.5 kHz). DUE TO PERTURBATIONS TO OTHER EXPERIMENTS, ACTIVE OPERATION WAS ON A LIMITED DUTY CYCLE.

**----- ISEE 1, HELLIWELL -----****INVESTIGATION NAME- VLF WAVE PROPAGATION**

NSSDC ID- 77-102A-13

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS  
INTERPLANETARY PHYSICS

**PERSONNEL**

PI - R.A. HELLIWELL  
OI - T.F. BELL

STANFORD U  
STANFORD U

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS INTENDED TO PROVIDE DATA TO STUDY INTERACTIONS BETWEEN DISCRETE VLF WAVES AND ENERGETIC PARTICLES IN THE MAGNETOSPHERE. THE VLF WAVES WERE PRODUCED BY A GROUND-BASED TRANSMITTER. INJECTION OF THE WAVE BEYOND THE IONOSPHERE WAS ASSURED BY TRANSMITTER LOCATION IN A REGION WHERE THE MAGNETIC LINES OF FORCE ARE OPEN. IN THIS CASE, SIPLE STATION, ANTARCTICA. THE INJECTED SIGNAL AND ANY STIMULATED VLF EMISSIONS WERE RECORDED THROUGH A LOOP ANTENNA BY A 1-TO 32-kHz BROADBAND RECEIVER ON THE SATELLITE. THE OBSERVED PARAMETERS WERE INTENSITY OF RECEIVED RADIO FREQUENCY AS A FUNCTION OF TIME.

**----- ISEE 1, HEPPNER -----****INVESTIGATION NAME- DC ELECTRIC FIELD**

NSSDC ID- 77-102A-11

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - J.P. HEPPNER  
OI - T.L. AGGSON  
OI - N.C. MAYNARD  
OI - D.A. GURNETT  
OI - D.P. CAUFFMAN

NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
U OF IOWA  
LOCKHEED PALO ALTO

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS INTENDED TO STUDY QUASI-STATIC ELECTRIC FIELD AND LOW-FREQUENCY PLASMA WAVES IN THE PLASMAPAUSE, MAGNETOSPHERE, MAGNETOSHEATH, AND SOLAR WIND. THE DOUBLE-PROBE FLOATING-POTENTIAL TECHNIQUE WAS APPLIED USING LONG-WIRE ANTENNA PROBES WITH AN EFFECTIVE ELECTRIC FIELD BASELINE OF 179 METERS. THE DC DIFFERENTIAL VOLTAGE WAS MEASURED 8 OR 32 TIMES PER SECOND, DEPENDING ON BIT RATE. IN ADDITION, THE DC FIELD WAS MEASURED AT SELECTED AZIMUTHAL ANGLES RELATIVE TO THE SUN AND THE MAGNETIC FIELD, AND THE PEAK VALUE OF DELTA V AND ITS AZIMUTHAL ANGLES. LOW-FREQUENCY WAVES WERE MEASURED IN 8 FREQUENCY BANDS AS FOLLOWS - 0.19 TO 0.6, 0.6 TO 1.9, 1.9 TO 6, 6 TO 19, 19 TO 60, 60 TO 190, 190 TO 600, AND 600 TO 1900 Hz. DC MODE MEASUREMENTS HAD A TWO-STEP VARIABLE GAIN AMPLIFIER CONTROLLED FROM THE GROUND. THE RESOLUTION IN THE HIGHEST GAIN STATE WAS 0.0005 MV/M. THE AC MEASUREMENT ELECTRONICS CONSISTED OF TWO AMPLIFIER SECTIONS. ONE AMPLIFIER WAS USED FOR LOW-FREQUENCY CHANNELS, AND ONE FOR HIGH-FREQUENCY CHANNELS. GAIN LINES FOR EACH AMPLIFIER WERE CONTROLLABLE INDEPENDENTLY FROM THE GROUND. IN THE HIGHEST GAIN MODE, EACH ANALYZER CHANNEL HAD A SENSITIVITY OF 0.04 MICROVOLTS/M RMS. THE EXPERIMENT COULD BE RUN IN EITHER A SUN-SENSOR SYNCHRONIZED OR A FREE STATE AS CONTROLLED FROM GROUND. IN ADDITION, THE AC PORTION COULD BE RUN IN AN AVERAGING MODE, OR AN ALTERNATING AVERAGING AND PEAK AMPLITUDE DETECTION MODE KEYED TO THE TELEMETRY READOUT SEQUENCE.

**----- ISEE 1, HOVESTADT -----****INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS**

NSSDC ID- 77-102A-05

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - D.K. HOVESTADT  
OI - J.J. O'GALLAGHER  
OI - M. SCHOLER  
OI - L.A. FISK  
OI - C.V. FAN  
OI - G. GLOECKLER

MPI-EXTRATELL PHYS  
U OF MARYLAND  
MPI-EXTRATELL PHYS  
U OF NEW HAMPSHIRE  
U OF ARIZONA  
U OF MARYLAND

**BRIEF DESCRIPTION**

THIS INSTRUMENT, CARRIED ON ISEE 1 AND ISEE 3, WAS DESIGNED TO MEASURE SOLAR, INTERPLANETARY, AND MAGNETOSPHERIC ENERGETIC IONS IN NUMEROUS BANDS WITHIN THE ENERGY RANGE 2 KEV/NUCLEON TO 80 MEV/NUCLEON, AND ELECTRONS IN FOUR CONTIGUOUS BANDS FROM 75 TO 1500 KEV. AT THE LOWER ENERGIES, CHARGE STATES OF HEAVY IONS IN THE HIGH SPEED (GREATER THAN 500 KM/S) SOLAR WIND WERE DETERMINED. IN THE RANGE 0.3 TO 80 MEV/NUCLEON, THE ENERGY SPECTRA, ANISOTROPIES, AND COMPOSITION OF ENERGETIC IONS WERE DETERMINED. IN THE LIMITED RANGE 0.4 TO 6 MEV/NUCLEON, SIMULTANEOUS DETERMINATION OF IONIC AND NUCLEAR CHARGE WAS POSSIBLE. THE INSTRUMENT CONSISTED OF THREE DIFFERENT SENSOR SYSTEMS. ULECA (ULTRALOW-ENERGY CHARGE ANALYZER) WAS AN ELECTROSTATIC ANALYZER WITH SOLID STATE DETECTORS. ITS ENERGY RANGE WAS APPROXIMATELY 3 TO 560 KEV/B. ULEWAT (ULTRALOW-ENERGY WIDE-ANGLE TELESCOPE) WAS A DE/DX - E THIN-WINDOW FLOW THROUGH PROPORTIONAL COUNTER/SOLID STATE DETECTOR TELESCOPE COVERING THE RANGE 0.2 TO 80 MEV/NUCLEON (FE). ULEEQ (ULTRALOW-ENERGY Z, E, AND Q) WAS A COMBINATION OF AN ELECTROSTATIC ANALYZER AND A DE/DX - E SYSTEM WITH A THIN-WINDOW PROPORTIONAL COUNTER AND A POSITION-SENSITIVE SOLID STATE DETECTOR. THE ENERGY RANGE WAS 0.4 TO 6 MEV/NUCLEON. DATA COULD BE OBTAINED IN 45-DEG SECTORS.

----- ISEE 1, MOZER-----

**INVESTIGATION NAME- QUASI-STATIC ELECTRIC FIELDS**

NSSDC ID- 77-102A-06

**INVESTIGATIVE PROGRAM  
CODE ST/CO-OP****INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS****PERSONNEL**

PI - F.S. MOZER	U OF CALIF, BERKELEY
OI - M.C. KELLEY	CORNELL U

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT WAS TO STUDY THE QUASI-STATIC ELECTRIC FIELD IN THE PLASMAPAUSE, MAGNETOSPHERE, MAGNETOSHEATH, AND SOLAR WIND. THE 8-CM-DIAM SPHERES WERE SEPARATED BY 73.5 CM AND WERE POSITIONED IN THE SATELLITE SPIN PLANE. TO ATTEMPT TO OVERCOME THE SPACECRAFT SHEATH (A POTENTIAL PROBLEM WHICH PLAUGES ALL ELECTRIC FIELD DETECTORS), AN ELECTRON GUN WAS INCLUDED ON THE SPACECRAFT BODY. THE INSTRUMENT WAS DESIGNED TO BE SENSITIVE TO FIELDS FROM 0.1 TO 200 MV/M IN THE FREQUENCY BAND OF 0 TO 12 Hz. THE EXPERIMENT ALSO MEASURED THE ELECTRIC FIELD COMPONENT OF WAVES AT FREQUENCIES LESS THAN 1000 Hz.

----- ISEE 1, OGILVIE-----

**INVESTIGATION NAME- FAST ELECTRONS**

NSSDC ID- 77-102A-02

**INVESTIGATIVE PROGRAM  
CODE ST/CO-OP****INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS****PERSONNEL**

PI - K.W. OGILVIE	NASA-GSFC
OI - J.D. SCUDDER	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT STUDIED THE TRANSPORT COEFFICIENTS OF TURBULENCE IN -- THE COLLISIONLESS PLASMA REPRESENTED BY THE INTERPLANETARY MEDIUM AND MAGNETOSHEATH, LOW-ENERGY SOLAR ELECTROKINETIC EVENTS, AND BOW SHOCK ASSOCIATED ELECTRONS. TWO TRIAXIAL SYSTEMS OF 127-DEG CYLINDRICAL ELECTROSTATIC ANALYZERS WERE USED TO MAKE THREE-DIMENSIONAL MEASUREMENTS OF THE ELECTRON DISTRIBUTION FUNCTION. THERE WERE THREE MODES OF OPERATION, WITH THE FOLLOWING NOMINAL ENERGY RANGES: SOLAR WIND, 7 TO 500 EV; MAGNETOSHEATH, 10 EV TO 2 KEV; AND MAGNETOTAIL AND SOLAR, 105 EV TO 7.05 KEV. ENERGY RESOLUTION ( $\Delta E/E$ ) WAS 0.07. THE ENTIRE SET OF SIX SIMULTANEOUS SPECTROMETER MEASUREMENTS WAS TAKEN WHILE THE SATELLITE ROTATED THROUGH 60 DEG. EACH SPECTROMETER CONSISTED OF THE CURVED PLATE ANALYZER AND TWO CHANNELTRON DETECTORS.

----- ISEE 1, RUSSELL-----

**INVESTIGATION NAME- FLUXGATE MAGNETOMETER**

NSSDC ID- 77-102A-04

**INVESTIGATIVE PROGRAM  
CODE ST/CO-OP****INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS****PERSONNEL**

PI - C.T. RUSSELL	U OF CALIF, LA
OI - R.L. MCPHERRON	U OF CALIF, LA
OI - P.C. HEDGECOCK	IMPERIAL COLLEGE
OI - E.W. GREENSTADT	TRW SYSTEMS GROUP
OI - M.G. KIVELSON	U OF CALIF, LA

**BRIEF DESCRIPTION**

IN THIS TRIAXIAL FLUXGATE MAGNETOMETER, THREE RING CORE SENSORS IN AN ORTHOGONAL TRIAD WERE ENCLOSED IN A FLIPPER MECHANISM AT THE END OF THE MAGNETOMETER BOOM. THE ELECTRONICS UNIT WAS ON THE MAIN BODY OF THE SPACECRAFT AT THE FOOT OF THE BOOM. THE MAGNETOMETER HAD TWO OPERATING RANGES OF PLUS OR MINUS 8192 NT AND PLUS OR MINUS 256 NT IN EACH VECTOR COMPONENT. THE DATA WERE DIGITIZED AND AVERAGED WITHIN THE INSTRUMENT TO PROVIDE INCREASED RESOLUTION AND TO PROVIDE NYQUIST FILTERING. THERE WERE TWO MODES FOR THE TRANSMISSION OF THE AVERAGED DATA. IN THE DOUBLE-PRECISION MODE OF OPERATION, 16-BIT SAMPLES OF DATA WERE TRANSMITTED. THIS PROVIDED A MAXIMUM RESOLUTION OF PLUS OR MINUS 1/4 NT OR 1/128 NT IN THE LOW AND HIGH SENSITIVITY RANGES. IN THE SINGLE-PRECISION MODE, ANY 8 CONSECUTIVE BITS OF THE ABOVE 16 BITS WERE SELECTED BY GROUND COMMAND FOR TRANSMISSION AND THE TELEMETRY BANDWIDTHS OF THE MAGNETOMETER WERE DOUBLED. THIS BANDWIDTH VARIED FROM 2 Hz AT THE LOW TELEMETRY RATE DOUBLE-PRECISION EXPERIMENT MODE TO 32 Hz AT THE HIGH TELEMETRY RATE SINGLE-PRECISION EXPERIMENT MODE.

----- ISEE 1, SHARP-----

**INVESTIGATION NAME- ION COMPOSITION**

NSSDC ID- 77-102A-12

**INVESTIGATIVE PROGRAM  
CODE ST/CO-OP****INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
PARTICLES AND FIELDS****PERSONNEL**

PI - R.D. SHARP	LOCKHEED PALO ALTO
OI - G. HAERENDEL	MPI-EXTRATERR PHYS
OI - H.R. ROSENBAUER	MPI-AERONOMY
OI - R.G. JOHNSON	LOCKHEED PALO ALTO
OI - E.G. SHELLEY	LOCKHEED PALO ALTO
OI - J. GEISS	U OF BERNE
OI - P.H. EBERHARDT	U OF BERNE
OI - H. BALSIGER	U OF BERNE
OI - C.R. CHAPPELL	NASA-MSFC
OI - A. GHIELMETTI	U OF BERNE
OI - D.T. YOUNG	U OF BERNE

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION WAS TO DETERMINE THE ION COMPOSITION AND ENERGY SPECTRA OF THE PLASMA WITHIN THE MAGNETOSPHERE, MAGNETOSHEATH, AND SOLAR WIND, AND TO DETERMINE THE ANGULAR DISTRIBUTION OF THE PLASMA IN THE MAGNETOSHEATH. AN ENERGETIC ION MASS SPECTROMETER WAS FLOWN THAT HAD AN ELECTROSTATIC ENERGY ANALYZER FOLLOWED BY A COMBINED CYLINDRICAL-ELECTROSTATIC/MAGNETIC MASS ANALYZER. A COMBINATION OF ELECTRON MULTIPLIERS WAS USED AS THE DETECTOR. THE ENERGY-PER-UNIT-CHARGE RANGE MEASURED WAS FROM 0 TO 17 KEV/Q. THE MASS-PER-UNIT-CHARGE RANGE MEASURED EXTENDED FROM 1 TO GREATER THAN 150 U/Q.

----- ISEE 1, WILLIAMS-----

**INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS**

NSSDC ID- 77-102A-09

**INVESTIGATIVE PROGRAM  
CODE ST/CO-OP****INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS****PERSONNEL**

PI - D.J. WILLIAMS	NOAA-ERL
OI - C.O. BOSTROM	APPLIED PHYSICS LAB
OI - B. WILKEN	MPI-AERONOMY
OI - T.A. FRITZ	NOAA-ERL
OI - G.M. WIBBEREN	U OF KIEL
OI - E. KEPPLER	MPI-AERONOMY

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO IDENTIFY AND TO STUDY PLASMA INSTABILITIES RESPONSIBLE FOR ACCELERATION, SOURCE AND LOSS MECHANISMS, AND BOUNDARY AND INTERFACE PHENOMENA THROUGHOUT THE ORBITAL RANGE OF THE MOTHER/DAUGHTER SATELLITES. A PROTON TELESCOPE AND AN ELECTRON SPECTROMETER WERE FLOWN ON EACH SPACECRAFT TO MEASURE DETAILED ENERGY SPECTRUM AND ANGULAR DISTRIBUTIONS. THESE DETECTORS USED SILICON SURFACE BARRIER TOTALLY DEPLETED SOLID-STATE DEVICES OF VARIOUS THICKNESSES, AREAS, AND CONFIGURATIONS. PROTONS IN 5 OR 16 CHANNELS BETWEEN 20 KEV AND 1.2 MEV, AND ELECTRONS IN 8 OR 16 CHANNELS BETWEEN 20 KEV AND 1 MEV WERE MEASURED. A SEPARATE SOLID-STATE DETECTOR SYSTEM MEASURED THE ENERGY SPECTRA AND PITCH-ANGLE DISTRIBUTIONS OF ALPHA PARTICLES AND HEAVY IONS IN THE ENERGY RANGE ABOVE 125 KEV PER NUCLEON.

\*\*\*\*\* ISEE 2\*\*\*\*\*

SPACECRAFT COMMON NAME- ISEE 2  
ALTERNATE NAMES- IMP-K PRIME, IME-D  
10423, ISEE-B  
DAUGHTER

NSSDC ID- 77-102B

LAUNCH DATE- 10/22/77 WEIGHT- 165.78 KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL  
UNITED STATES

ESA  
NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 3454.1 MIN  
PERIAPSIS- 280. KM ALT

EPOCH DATE- 10/23/77  
INCLINATION- 28.7 DEG  
APOAPSIS- 138317. KM ALT

PERSONNEL

MG - J.R. HOLTZ  
SC - E.R. SCHMERLING  
PM - A. HAWKWARD  
PS - A.C. DURNEY

NASA HEADQUARTERS  
NASA HEADQUARTERS  
ESA-ESTEC  
ESA-ESTEC

BRIEF DESCRIPTION

THE EXPLORER CLASS DAUGHTER SPACECRAFT WAS PART OF THE MOTHER/DAUGHTER/HELIOPAUSE MISSION (ISEE A, B, AND C). THE PURPOSES OF THE MISSION WERE -- (1) TO INVESTIGATE SOLAR-TERRESTRIAL RELATIONSHIPS AT THE OUTERMOST BOUNDARIES OF THE EARTH'S MAGNETOSPHERE; (2) TO EXAMINE IN DETAIL THE STRUCTURE OF THE SOLAR WIND NEAR EARTH AND THE SHOCK WAVE THAT FORMS THE INTERFACE BETWEEN THE SOLAR WIND AND EARTH; AND (3) TO CONTINUE THE INVESTIGATION OF COSMIC RAYS AND SOLAR FLARES IN THE INTERPLANETARY REGION NEAR 1 AU. THE MISSION THUS EXTENDED THE INVESTIGATIONS OF PREVIOUS IMP SPACECRAFT. THE MOTHER/DAUGHTER PORTION OF THE MISSION CONSISTED OF TWO SPACECRAFT WITH A STATION-KEEPING CAPABILITY IN A HIGHLY ECCENTRIC EARTH ORBIT WITH APOGEE OF 23 EARTH RADII. THE SPACECRAFT MAINTAINED A SMALL SEPARATION DISTANCE, AND MADE SIMULTANEOUS COORDINATED MEASUREMENTS TO PERMIT SEPARATION OF SPATIAL FROM TEMPORAL IRREGULARITIES IN THE NEAR-EARTH SOLAR WIND, THE BOW SHOCK, AND INSIDE THE MAGNETOSPHERE. THE SPIN RATE OF THE SPACECRAFT WAS FIXED AT 19.8 RPM, DIFFERING SLIGHTLY FROM THE ISEE-A SPACECRAFT. FOR INSTRUMENT DESCRIPTIONS WRITTEN BY THE INVESTIGATORS, SEE IEEE TRANSACTIONS ON GEOSCIENCE ELECTRONICS, VOL. GE-16, NO. 3, JULY, 1978.

----- ISEE 2, ANDERSON-----

INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102B-08

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - K.A. ANDERSON  
OI - C.I. MENG  
OI - J.M. BOSQUED  
OI - R. PELLAT  
OI - F.V. CORONITI  
OI - H. REME  
OI - R.P. LIN  
OI - G.K. PARKS

U OF CALIF. BERKELEY  
APPLIED PHYSICS LAB  
CESR  
CTR FOR THEORETIC PHYS  
U OF CALIF. LA  
CESR  
U OF CALIF. BERKELEY  
U OF WASHINGTON

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO DETERMINE, BY USING IDENTICAL INSTRUMENTATION ON THE MOTHER/DAUGHTER SPACECRAFT, THE SPATIAL EXTENT, PROPAGATION VELOCITY, AND TEMPORAL BEHAVIOR OF A WIDE VARIETY OF PARTICLE PHENOMENA. ELECTRONS WERE MEASURED AT 2 AND 6 KEV AND IN TWO BANDS: 8 TO 200 KEV AND 30 TO 200 KEV. PROTONS WERE MEASURED AT 2 AND 6 KEV AND IN THREE BANDS: 8 TO 200 KEV, 30 TO 200 KEV, AND 200 TO 380 KEV. THE 30 KEV THRESHOLD COULD BE COMMANDED TO 15 OR 60 KEV. IDENTICAL INSTRUMENTATION ON EACH SPACECRAFT CONSISTED OF A PAIR OF SURFACE BARRIER SEMICONDUCTOR DETECTOR TELESCOPES (ONE WITH A FOIL AND ONE WITHOUT A FOIL) AND FOUR FIXED-ENERGY ELECTRIC FIELD PARTICLE ANALYZERS. THE TELESCOPES HAD A VIEWING CONE WITH HALF ANGLE 40 DEGREES, ORIENTED AT ABOUT 20 DEGREES TO THE SPIN AXIS.

----- ISEE 2, EGIDI-----

INVESTIGATION NAME- SOLAR WIND IONS

NSSDC ID- 77-102B-02

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - A. EGIDI  
OI - G. MORENO  
OI - P. CERULLI  
OI - V. FORMISANO  
OI - S.C. CANTARANO  
OI - S.J. BAME  
OI - G. PASCHMANN

CNR, SPACE PLASMA LAB  
LOS ALAMOS SCI LAB  
MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

THIS INSTRUMENT WAS DESIGNED TO MEASURE THE ANGULAR DISTRIBUTIONS AND ENERGY SPECTRA OF POSITIVE IONS IN THE SOLAR WIND. THE MAIN REGION OF INTEREST WAS OUTWARD FROM AND INCLUDING THE MAGNETOPAUSE (GREATER THAN 8 EARTH RADII). TWO HEMISPHERICAL ELECTROSTATIC ANALYZERS WERE USED TO COVER THE ENERGY RANGE 100 EV TO 10 KEV/Q IN UP TO 64 ENERGY CHANNELS. THERE WERE TWO OPERATING MODES: ONE FOR HIGH TIME RESOLUTION AND ONE FOR HIGH ENERGY RESOLUTION. ENERGY LEVELS WERE KEPT CONSTANT THROUGH A COMPLETE SPACECRAFT REVOLUTION.

----- ISEE 2, FRANK-----

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102B-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - L.A. FRANK  
OI - V.R. VASYLIUNAS  
OI - C.F. KENNEL

U OF IOWA  
MPI-AERONOMY  
U OF CALIF. LA

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO STUDY, BY MEANS OF IDENTICAL INSTRUMENTATION ON THE MOTHER/DAUGHTER SPACECRAFT, THE SPATIAL AND TEMPORAL VARIATIONS OF THE SOLAR WIND AND MAGNETOSHEATH ELECTRONS AND IONS. PROTONS AND ELECTRONS IN THE ENERGY RANGE FROM 1 EV TO 45 KEV WERE MEASURED IN 64 CONTIGUOUS ENERGY BANDS WITH AN ENERGY RESOLUTION (DELTA E/E) OF 0.16. A QUADRISPHERICAL LOW-ENERGY PROTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER (LEPEDEA), EMPLOYING SEVEN CONTINUOUS-CHANNEL ELECTRON MULTIPLIERS IN EACH OF ITS TWO (ONE FOR PROTONS AND ONE FOR ELECTRONS) ELECTROSTATIC ANALYZERS WAS FLOWN ON BOTH MOTHER AND DAUGHTER SPACECRAFT. ALL BUT 2 PERCENT OF THE 4 PI-SR SOLID-ANGLE WAS COVERED FOR PARTICLE VELOCITY VECTORS. A GM TUBE WAS ALSO INCLUDED, WITH A CONICAL FIELD OF VIEW OF 40 DEG FULL ANGLE, PERPENDICULAR TO THE SPIN AXIS. THIS DETECTOR WAS SENSITIVE TO ELECTRONS WITH E GREATER THAN OR EQUAL TO 45 KEV, AND PROTONS WITH E GREATER THAN OR EQUAL TO 600 KEV.

----- ISEE 2, GURNETT-----

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102B-05

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - D.A. GURNETT  
OI - F.L. SCARF  
OI - E.J. SMITH  
OI - R.W. FRÉDÉRICKS

U OF IOWA  
TRW SYSTEMS GROUP  
NASA-JPL  
TRW SYSTEMS GROUP

BRIEF DESCRIPTION

IN THIS EXPERIMENT, A SINGLE-AXIS SEARCH COIL MAGNETOMETER WITH A HIGH PERMEABILITY CORE AND TWO ELECTRIC FIELD DIPOLES (50 M AND 0.61 M) MEASURED WAVE PHENOMENON OCCURRING WITHIN THE MAGNETOSPHERE AND SOLAR WIND IN CONJUNCTION WITH A SIMILAR EXPERIMENT FLOWN ON THE MOTHER SPACECRAFT. THE ANTENNAS WERE MOUNTED PERPENDICULAR TO THE SPIN AXIS. THE INSTRUMENTATION WAS COMPOSED OF TWO ELEMENTS: (1) A HIGH TIME RESOLUTION SPECTRUM ANALYZER WITH 16 FREQUENCY CHANNELS (IDENTICAL TO THOSE ON ISEE 1) FROM 5.62 Hz TO 31.1 KHz, ALL CHANNELS WERE SAMPLED 16 TIMES PER S, DEPENDING ON BIT RATE; AND (2) A WIDE-BAND RECEIVER TO CONDITION ELECTRIC AND MAGNETIC WAVEFORMS FOR TRANSMISSION TO THE GROUND VIA THE SPECIAL-PURPOSE ANALOG TRANSMITTER. THERE WERE TWO BASIC FREQUENCY CHANNELS: FROM 10 Hz TO 1 KHz AND FROM 650 Hz TO 10 KHz. IN ADDITION, THE FREQUENCY RANGE COULD BE SHIFTED BY A FREQUENCY CONVERSION SCHEME TO ANY OF EIGHT RANGES UP TO 2.0 MHz.

----- ISEE 2, HARVEY-----

INVESTIGATION NAME- RADIO PROPAGATION

NSSDC ID- 77-102B-06

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - C.C. HARVEY  
OI - R.E. GENDRIN  
OI - J.R. McAFFEE  
OI - M. PETIT  
OI - D. JONES  
OI - J.P. ETCHETO  
OI - R.J.L. GRARD

PARIS OBSERVATORY  
CNET  
NOAA-ERL  
CNET  
ESA-ESTEC  
CNET  
ESA-ESTEC

ORIGINAL PAGE IS  
OF POOR QUALITY

**BRIEF DESCRIPTION**

THE TOTAL ELECTRON CONTENT BETWEEN THE MOTHER AND DAUGHTER WAS OBTAINED BY MEASURING THE PHASE DELAY INTRODUCED BY THE AMBIENT PLASMA ONTO A WAVE OF FREQUENCY ABOUT 683 KHZ, TRANSMITTED FROM THE MOTHER (EXPERIMENT B) AND RECEIVED ON THE DAUGHTER. THE PHASE WAS COMPARED AGAINST A PHASE-COHERENT SIGNAL TRANSMITTED FROM THE MOTHER TO THE DAUGHTER BY MODULATION ONTO A CARRIER OF FREQUENCY HIGH ENOUGH (272.5 MHZ) TO BE UNAFFECTED BY THE AMBIENT PLASMA.

----- ISEE 2, PASCHMANN -----

INVESTIGATION NAME- FAST PLASMA

NSSDC ID- 77-1028-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS  
SPACE PLASMAS**PERSONNEL**

PI - G.	PASCHMANN	MPI-EXTRATELL PHYS
OI - W.C.	FELDMAN	LOS ALAMOS SCI LAB
OI - E.W.	HONES, JR.	LOS ALAMOS SCI LAB
OI - K.	SCHINDLER	RUHR-U BOCHUM
OI - H.	MIGGENREIDER	MPI-EXTRATELL PHYS
OI - S.J.	BAME	LOS ALAMOS SCI LAB
OI - H.	VOLK	MPI-NUCLEAR PHYS
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - M.D.	MONTGOMERY	LOS ALAMOS SCI LAB
OI - J.R.	ASURIDGE	LOS ALAMOS SCI LAB

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO STUDY THE PLASMA VELOCITY DISTRIBUTIONS AND THEIR SPATIAL AND TEMPORAL VARIATIONS IN THE SOLAR WIND, BOW SHOCK, MAGNETOSHEATH, MAGNETOPAUSE, AND MAGNETOTAIL (WITHIN THE MAGNETOSPHERE). ONE-, TWO-, AND THREE-DIMENSIONAL VELOCITY DISTRIBUTIONS FOR POSITIVE IONS AND ELECTRONS WERE MEASURED USING TWO 90-DEG SPHERICAL ELECTROSTATIC ANALYZER WITH CHANNELTRODE ELECTRON MULTIPLIERS AS DETECTORS. IN CONJUNCTION WITH SIMILAR INSTRUMENTATION PROVIDED BY S. J. BAME/LASL FOR THE MOTHER SPACECRAFT, PROTONS FROM 50 EV TO 40 KEV (AND ELECTRONS FROM 5 EV TO 20 KEV) WERE MEASURED WITH 10 PERCENT ENERGY RESOLUTION IN TWO RANGES EACH.

----- ISEE 2, RUSSELL -----

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-1028-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS**PERSONNEL**

PI - C.T.	RUSSELL	U OF CALIF, LA
OI - R.L.	MCPHERRON	U OF CALIF, LA
OI - P.C.	HEDGECOCK	IMPERIAL COLLEGE
OI - E.W.	GREENSTADT	TRW SYSTEMS GROUP
OI - M.G.	KIVELSON	U OF CALIF, LA

**BRIEF DESCRIPTION**

IN THIS TRIAXIAL FLUXGATE MAGNETOMETER, THREE RING CORE SENSORS IN AN ORTHOGONAL TRIAD WERE ENCLOSED IN A FLIPPER MECHANISM AT THE END OF THE MAGNETOMETER BOOM. THE ELECTRONICS UNIT WAS ON THE MAIN BODY OF THE SPACECRAFT AT THE FOOT OF THE BOOM. THE MAGNETOMETER HAD TWO OPERATING RANGES OF PLUS OR MINUS 8192 NT AND PLUS OR MINUS 256 NT IN EACH VECTOR COMPONENT. THE DATA WERE DIGITIZED AND AVERAGED WITHIN THE INSTRUMENT TO PROVIDE INCREASED RESOLUTION AND TO PROVIDE NYQUIST FILTERING. THERE WERE TWO MODES FOR THE TRANSMISSION OF THE AVERAGED DATA. IN THE DOUBLE-PRECISION MODE OF OPERATION, 16-BIT SAMPLES OF DATA WERE TRANSMITTED. THIS PROVIDED A MAXIMUM RESOLUTION OF PLUS OR MINUS 1/4 NT OR 1/128 NT IN THE LOW- AND HIGH-SENSITIVITY RANGES.

----- ISEE 2, WILLIAMS -----

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 77-1028-07

INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS**PERSONNEL**

PI - D.J.	WILLIAMS	NOAA-ERL
OI - T.A.	FRITZ	NOAA-ERL
OI - C.O.	BOSTROM	APPLIED PHYSICS LAB
OI - E.	KEPPLER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - G.H.	WIBBERENZ	U OF KIEL

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO IDENTIFY AND TO STUDY PLASMA INSTABILITIES RESPONSIBLE FOR ACCELERATION, SOURCE AND LOSS MECHANISMS, AND BOUNDARY AND INTERFACE PHENOMENA THROUGHOUT THE ORBITAL RANGE OF MOTHER/ DAUGHTER SATELLITES. A PROTON TELESCOPE AND AN ELECTRON SPECTROMETER WERE FLOWN ON EACH SPACECRAFT TO MEASURE DETAILED ENERGY SPECTRA AND ANGULAR DISTRIBUTIONS. THESE DETECTORS USED SILICON SURFACE-BARRIER, TOTALLY DEPLETED SOLID-STATE DEVICES OF VARIOUS THICKNESSES, AREAS, AND CONFIGURATIONS. PROTONS IN 5 DIRECTIONS AND 12 ENERGY CHANNELS BETWEEN 20 KEV AND 2 MEV AND ELECTRONS IN 5 DIRECTIONS AND 12 ENERGY CHANNELS BETWEEN 20 KEV AND 300 KEV (TO 1.2 MEV FOR 90 DEG) WERE MEASURED. DATA WAS ACCUMULATED IN UP TO 32 SECTORS PER SPIN.

\*\*\*\*\* ISEE 3 \*\*\*\*\*

SPACERCAFT COMMON NAME- ISEE 3  
ALTERNATE NAMES- STP PROBE, IME-H  
HELIOCENTRIC, INTNL SUN EARTH EXPL-C  
ISEE-C

NSSDC ID- 78-079A

LAUNCH DATE- 08/12/78  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

WEIGHT- 469. KG

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-CSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- 365. DAYS  
PERIAPSIS- 0.99 AU RAD

EPOCH DATE- 11/25/78  
INCLINATION- 0. DEG

APOAPSIS- 0.99 AU RAD

PERSONNEL  
MG - J.P. CORRIGAN  
SC - E.R. SCHMERLING  
PM - R.O. WALES  
PS - T.T. VON ROSENVINGE

NASA-GSFC

NASA HEADQUARTERS

NASA-GSFC

NASA-GSFC

**BRIEF DESCRIPTION**

THE EXPLORER CLASS HELIOCENTRIC SPACECRAFT WAS PART OF THE MOTHER/DAUGHTER/HELIOCENTRIC MISSION (ISEE A, B, AND C). THE PURPOSES OF THE MISSION WERE (1) TO INVESTIGATE SOLAR/TERRESTRIAL RELATIONSHIPS AT THE OUTERMOST BOUNDARIES OF THE EARTH'S MAGNETOSPHERE, (2) TO EXAMINE IN DETAIL THE STRUCTURE OF THE SOLAR WIND NEAR THE EARTH AND THE SHOCK WAVE THAT FORMS THE INTERFACE BETWEEN THE SOLAR WIND AND EARTH, AND (3) TO CONTINUE THE INVESTIGATION OF COSMIC RAYS AND SOLAR FLARES IN THE INTERPLANETARY REGION NEAR 1 AU. THE MISSION THUS EXTENDED THE INVESTIGATIONS OF PREVIOUS IMP SPACECRAFT. THE LAUNCH OF THREE COORDINATED SPACECRAFT IN THIS MISSION PERMITTED THE SEPARATION OF SPATIAL AND TEMPORAL EFFECTS. THE HELIOCENTRIC SPACECRAFT HAD A SPIN AXIS NORMAL TO THE ECLIPSTIC PLANE AND A SPIN RATE OF ABOUT 20 RPM. IT WAS PLACED INTO AN ELLIPTICAL HALO ORBIT AROUND THE LIBRATION POINT (L1) 235 EARTH RADII ON THE SUN SIDE OF THE EARTH, WHERE IT CONTINUOUSLY MONITORED CHANGES IN THE NEAR-EARTH INTERPLANETARY MEDIUM. BECAUSE BOTH THE MOTHER AND DAUGHTER SPACECRAFT HAD ECCENTRIC GEOCENTRIC ORBITS, IT WAS HOPEFUL THAT THIS MISSION WOULD MEASURE THE CAUSE/EFFECT RELATIONSHIPS BETWEEN THE INCIDENT SOLAR PLASMA AND THE MAGNETOSPHERE. FINALLY, THE HELIOCENTRIC SPACECRAFT ALSO PROVIDED A NEAR-EARTH BASE FOR MAKING COSMIC-RAY AND OTHER PLANETARY MEASUREMENTS FOR COMPARISON WITH COINCIDENT MEASUREMENTS FROM DEEP-SPACE PROBES. FOR INSTRUMENT DESCRIPTIONS WRITTEN BY THE INVESTIGATORS, SEE IEEE TRANSACTIONS ON GEOSCIENCE ELECTRONICS, VOL. GE-16, NO. 3, JULY, 1978.

----- ISEE 3, ANDERSON -----

INVESTIGATION NAME- INTERPLANETARY AND SOLAR ELECTRONS

NSSDC ID- 78-079A-09  
INVESTIGATIVE PROGRAM  
CODE ST/CO-OPINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS

PERSONNEL  
PI - K.A. ANDERSON  
OI - R.P. LIN  
OI - D.F. SMITH  
OI - S.R. KANE

U OF CALIF, BERKELEY

U OF CALIF, BERKELEY

HIGH ALTITUDE OBS

U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO STUDY SPECTRA AND ANISOTROPIES OF INTERPLANETARY AND SOLAR ELECTRONS (2 TO 1000 KEV) IN THE TRANSITION ENERGY RANGE BETWEEN SOLAR WIND AND LOW-ENERGY COSMIC RAYS. THE ELECTRONS WERE MEASURED BY A PAIR OF PASSIVELY COOLED, SURFACE BARRIER SEMICONDUCTOR DETECTOR TELESCOPES (APPROXIMATELY 15 KEV TO APPROXIMATELY 1 MEV) AND BY A HEMISPHERICAL PLATE ELECTROSTATIC ANALYZER WITH CHANNEL-MULTIPLIER DETECTORS (2-18 KEV). COUNTING RATES WERE SECTORED INTO ANGULAR SECTORS ABOUT EITHER THE MAGNETIC FIELD OR THE SUN DIRECTION. THE TELESCOPE YIELDED 8 OR 16 SECTORS AND THE ANALYZER YIELDED 16 SECTORS.

----- ISEE 3, ANDERSON -----

INVESTIGATION NAME- X- AND GAMMA-RAY BURSTS

NSSDC ID- 78-079A-10 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - K.A. ANDERSON U OF CALIF. BERKELEY  
OI - S.R. KANE U OF CALIF. BERKELEY  
OI - W.D. EVANS LOS ALAMOS SCI LAB  
OI - R.W. KLEBESADEL LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO PROVIDE CONTINUOUS COVERAGE OF SOLAR FLARE X RAYS AND TRANSIENT COSMIC GAMMA-RAY BURSTS. DETECTORS WERE A XENON-FILLED PROPORTIONAL COUNTER (5-14 KEV IN 6 CHANNELS) AND A SODIUM IODIDE SCINTILLATOR (12-1250 KEV IN 12 CHANNELS). THERE WERE FOUR OPERATING MODES: NORMAL, FLARE-1, FLARE-2, AND GAMMA BURST. IN NORMAL MODE, TIME RESOLUTION WAS 0.5 TO 4 S, DEPENDING ON THE CHANNEL. IN GAMMA BURST MODE, BEST TIME RESOLUTION WAS IN STORED DATA, WITH 0.25 TO 125 MS RESOLUTION.

----- ISEE 3, GAME -----

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- 78-079A-01 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - S.J. BAME LOS ALAMOS SCI LAB  
OI - J.R. ASBRIDGE LOS ALAMOS SCI LAB  
OI - E.W. HONES, JR. LOS ALAMOS SCI LAB  
OI - M.D. MONTGOMERY LOS ALAMOS SCI LAB  
OI - W.C. FELDMAN LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO MAKE AN INTEGRATED STUDY OF THE NATURE, ORIGIN AND EVOLUTION OF STRUCTURE IN THE INTERPLANETARY MEDIUM. ALSO, THE THERMAL STATE OF THE INTERPLANETARY PLASMA WAS STUDIED, UNPERTURBED BY THE EARTH'S BOW SHOCK. ION VELOCITY DISTRIBUTIONS WERE MEASURED BY A 135-DEG SPHERICAL ELECTROSTATIC ANALYZER IN BOTH TWO AND THREE DIMENSIONS. STEP ENERGY RESOLUTION FOR EACH ENERGY WINDOW WAS 4.2 PERCENT. ELECTRON VELOCITY DISTRIBUTIONS WERE MEASURED BY A 90-DEG SPHERICAL ELECTROSTATIC ANALYZER, ALSO IN TWO AND THREE DIMENSIONS. THE ENERGY WINDOW PER STEP FOR ELECTRONS WAS 10 PERCENT. CHANNELTRON ELECTRON MULTIPLIERS WERE USED AS DETECTORS FOR EACH OF THE ANALYZERS. SOLAR WIND ELECTRONS WERE MEASURED IN 15 CONTIGUOUS CHANNELS FROM 8.5 TO 1140 EV. A SPECIAL PHOTOELECTRON RANGE OF 1.6 TO 220 EV COULD BE COMMANDED. VARIOUS MIXTURES OF DATA FOR 2-D AND 3-D DISTRIBUTION FUNCTIONS COULD BE SELECTED. IONS WERE MEASURED IN 32 CHANNELS FROM 237 EV PER CHARGE TO 10.7 KEV PER CHARGE. VARIOUS MODES WERE AVAILABLE FOR BASIC SWEEP, SEARCH, AND TRACKING OF THE PEAK OF THE DISTRIBUTION.

----- ISEE 3, HECKMAN -----

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAY

NSSDC ID- 78-079A-05 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - H.M. HECKMAN LAWRENCE BERKELEY LAB  
OI - D.E. GREINER U OF CALIF. BERKELEY

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO DETERMINE THE ISOTOPIC ABUNDANCE IN THE PRIMARY COSMIC RAYS FOR HYDROGEN THROUGH NICKEL. THE INSTRUMENT USED A 10-ELEMENT, SOLID-STATE, PARTICLE TELESCOPE CONSISTING OF LITHIUM-DRIFTED SILICON DETECTORS. ENERGY RANGES MEASURED RAN FROM APPROXIMATELY 20 TO APPROXIMATELY 500 MEV PER NUCLEON. DIRECTION OF INCIDENT NUCLEI WAS OBTAINED FROM A SIX-PLANE DRIFT CHAMBER WITH 2-DEG RESOLUTION.

----- ISEE 3, HOVESTADT -----

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-03 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - D.K. HOVESTADT MPI-EXTRATERR PHYS  
OI - J.J. O'GALLAGHER U OF MARYLAND  
OI - C.V. FAN U OF ARIZONA  
OI - G. GLOECKLER U OF MARYLAND  
OI - M. SCHOLER MPI-EXTRATERR PHYS  
OI - L.A. FISK U OF NEW HAMPSHIRE

BRIEF DESCRIPTION

THIS INSTRUMENT, CARRIED ON ISEE 1 AND ISEE 3, WAS DESIGNED TO MEASURE SOLAR, INTERPLANETARY, AND MAGNETOSPHERIC ENERGETIC IONS IN NUMEROUS BANDS WITHIN THE ENERGY RANGE 2 KEV/NUCLEON TO 80 MEV/NUCLEON, AND ELECTRONS IN FOUR CONTIGUOUS BANDS FROM 75 TO 1300 KEV. AT THE LOWER ENERGIES, CHARGE STATES OF HEAVY IONS IN THE HIGH SPEED (GREATER THAN 500 KM/S) SOLAR WIND WERE DETERMINED. IN THE RANGE 0.3 TO 80 MEV/NUCLEON, THE ENERGY SPECTRA, ANISOTROPIES, AND COMPOSITION OF ENERGETIC IONS WERE DETERMINED. IN THE LIMITED RANGE 0.4 TO 6 MEV/NUCLEON, SIMULTANEOUS DETERMINATION OF IONIC AND NUCLEAR CHARGE WAS POSSIBLE. THE INSTRUMENT CONSISTED OF THREE DIFFERENT SENSOR SYSTEMS. ULECA (ULTRALOW-ENERGY CHARGE ANALYZER) WAS AN ELECTROSTATIC ANALYZER WITH SOLID STATE DETECTORS. 175 ENERGY RANGE WAS APPROXIMATELY 3 TO 560 KEV/CHARGE. ULEWAT (ULTRALOW-ENERGY WIDE-ANGLE TELESCOPE) WAS A DE/DX - E THIN-WINDOW FLOW THROUGH PROPORTIONAL COUNTER/SOLID STATE DETECTOR TELESCOPE COVERING THE RANGE 0.2 TO 80 MEV/NUCLEON (FE). ULEZEG (ULTRALOW-ENERGY Z, E, AND Q) WAS A COMBINATION OF AN ELECTROSTATIC ANALYZER AND A DE/DX - E SYSTEM WITH A THIN-WINDOW PROPORTIONAL COUNTER AND A POSITION-SENSITIVE SOLID STATE DETECTOR. THE ENERGY RANGE WAS 0.4 TO 6 MEV/NUCLEON. DATA COULD BE OBTAINED IN 45-DEG SECTORS.

----- ISEE 3, HYNDS -----

INVESTIGATION NAME- ENERGETIC PROTONS

NSSDC ID- 78-079A-08 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - R.J. HYNDS IMPERIAL COLLEGE  
OI - J.J. VAN ROOIJEN U OF Utrecht  
OI - J.M. VAN GILS U OF Utrecht  
OI - R.M. VAN DEN NIEUWENHOF U OF Utrecht  
OI - K.P. WENZEL ESA-ESTEC  
OI - A.C. DURNEY ESA-ESTEC  
OI - T.N. SANDERSON ESA-ESTEC  
OI - V. DOMINGO ESA-ESTEC  
OI - D.E. PAGE ESA-ESTEC  
OI - A. BALOGH IMPERIAL COLLEGE  
OI - C. DE JAGER U OF Utrecht  
OI - H. ELLIOT IMPERIAL COLLEGE

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO STUDY LOW-ENERGY SOLAR PROTON ACCELERATION AND PROPAGATION PROCESSES IN INTERPLANETARY SPACE. THE INSTRUMENT MEASURED THE ENERGY SPECTRUM IN 8 CHANNELS, AND THE 3-DIMENSIONAL ANGULAR DISTRIBUTION OF PROTONS IN THE ENERGY RANGE 0.035 TO 1.6 MEV WITH A BASIC TIME RESOLUTION OF 16 S. COUNTS OF EACH CHANNEL WERE GROUPED INTO EIGHT 45-DEG SECTORS. THE INSTRUMENT CONSISTED OF THREE IDENTICAL TELESCOPES MOUNTED AT 30, 60, AND 135 DEG RELATIVE TO THE SPACECRAFT SPIN AXIS, EACH CONTAINING TWO SURFACE BARRIER DETECTORS, A MECHANICAL COLLIMATOR, AND A 'BROOM' MAGNET TO SWEEP AWAY ELECTRONS.

----- ISEE 3, MEYER -----

INVESTIGATION NAME- COSMIC-RAY ELECTRONS AND NUCLEI

NSSDC ID- 78-079A-06 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - P. MEYER U OF CHICAGO  
OI - P. EVENSON U OF CHICAGO

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO STUDY PARTICLE PROPAGATION WITHIN THE SOLAR SYSTEM AND THE PROPERTIES OF THE INTERPLANETARY MEDIUM. THE FOLLOWING SPECIES WERE RESOLVED: (1) ELECTRONS (DIFFERENTIAL SPECTRUM FROM 5 TO 400 MEV); (2) NUCLEI FROM PROTONS TO THE IRON GROUP (DIFFERENTIAL SPECTRA AND RELATIVE ABUNDANCES FROM 30 TO 15,000 MEV/NUCLEON); AND (3) HELIUM THROUGH SULFUR. A CHARGE PARTICLE TELESCOPE WAS USED TO MAKE THESE MEASUREMENTS. IT CONSISTED OF THREE SOLID-STATE DETECTORS, A GAS CERENKOV COUNTER, A CESIUM IODIDE SCINTILLATION DETECTOR, TWO PLASTIC SCINTILLATION COUNTERS, AND A QUARTZ CERENKOV COUNTER. THE DESIGN OF THE TELESCOPE WAS BASED ON THAT USED IN EXPERIMENT 6B-014A-09 FOR OGO 5.

----- ISEE 3, OGILVIE -----

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 78-079A-11

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - K.W. OGILVIE	NASA-GSFC
OI - J. GEISS	U OF BERKELEY
OI - M.H. ACUNA	NASA-GSFC
OI - R.A. COPLAN	U OF MARYLAND
OI - D.L. LIND	NASA-JSC

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A HEMISPHERICAL ELECTROSTATIC ENERGY ANALYZER AND A WIEN VELOCITY FILTER CONFIGURED AS A MASS SPECTROMETER TO DETERMINE THE CHARGE STATE AND ISOTOPIC CONSTITUTION OF THE SOLAR WIND. THE INSTRUMENT HAD AN ENERGY PER UNIT CHARGE RANGE OF 0.84 TO 11.7 KEV PER CHARGE, A MASS PER UNIT CHARGE RANGE OF 1.5 TO 5.6 U PER CHARGE, AND A VELOCITY RANGE OF 300 TO 600 KM/S.

----- ISEE 3, SCARF -----

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 78-079A-07

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - F.L. SCARF	TRW SYSTEMS GROUP
OI - D.A. GURNETT	U OF IOWA
OI - E.J. SMITH	NASA-JPL
OI - R.W. FREDERICKS	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO PROVIDE DATA FOR PLASMA WAVE STUDIES UNDERTAKEN TO GAIN A BETTER UNDERSTANDING OF THE WAVE-PARTICLE INTERACTION AND PLASMA INSTABILITIES, WHICH LEAD TO THE EQUIVALENT COLLISION PHENOMENA THAT PRODUCE APPARENT FLUID-LIKE BEHAVIOR IN THE SOLAR WIND NEAR 1 AU. TWO ELECTRIC DIPOLES AND A MAGNETIC SEARCH COIL, BOOM-MOUNTED, WERE USED TO MEASURE MAGNETIC AND ELECTRIC FIELD WAVE LEVELS FROM 17 Hz TO 1 kHz IN EIGHT CHANNELS AND ELECTRIC FIELD LEVELS FROM 17 Hz TO 100 kHz IN 16 CHANNELS. IN ADDITION, A THIRD SPECTRUM ANALYZER WITH 3 BANDS BETWEEN 0.316 AND 8.8 Hz WAS INCLUDED FOR MEASUREMENT OF THE MAGNETIC FIELD. THIS UNIT USED THE SEARCH COIL, BUT WAS LOCATED WITHIN THE ELECTRONICS UNIT OF EXPERIMENT 78-079A-02.

----- ISEE 3, SMITH -----

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 78-079A-02

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY MAGNETIC FIELDS  
PARTICLES AND FIELDS

PERSONNEL

PI - E.J. SMITH	NASA-JPL
OI - L. DAVIS, JR.	CALIF INST OF TECH
OI - G.L. SISCOE	U OF CALIF, LA
OI - D.E. JONES	BRIGHAM YOUNG U
OI - B.T. TSURUTANI	NASA-JPL

BRIEF DESCRIPTION

THE INSTRUMENTATION FOR THIS EXPERIMENT CONSISTED OF A BOOM-MOUNTED, TRIAXIAL VECTOR HELIUM MAGNETOMETER. MEASUREMENTS WERE MADE OF THE STEADY MAGNETIC FIELD AND ITS LOW-FREQUENCY VARIATIONS. EIGHT FIELD AMPLITUDE RANGES (MINUS TO PLUS 4, 10, 42, 144, 640, 4000, 22,000, AND 140,000 NT) WERE AVAILABLE. THE INSTRUMENT RANGED UP AND DOWN AUTOMATICALLY OR COULD BE COMMANDED INTO A SPECIFIC RANGE. THE FIELD EQUIVALENT NOISE POWER SPECTRAL DENSITY WAS 2.E-6 NT SQUARED PER HERTZ (INDEPENDENT OF FREQUENCY). OR 0.01 NT RMS IN THE PASSBAND 0 TO 0.5 Hz. A SINGLE-AXIS SPECTRUM ANALYZER MEASURED FLUCTUATIONS PARALLEL TO THE SPACECRAFT SPIN AXIS IN THREE FREQUENCY BANDS CENTERED AT 0.33, 3.2, AND 8.8 Hz.

----- ISEE 3, STEINBERG -----

INVESTIGATION NAME- RADIO MAPPING

NSSDC ID- 78-079A-10

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
RADIO PHYSICS  
SCALAR PHYSICS

PERSONNEL

PI - J.L. STEINBERG
OI - P. COUTURIER
OI - R. KNOLL
OI - J. FAINEBERG
OI - R.B. STONE
OI - S.B. MOSIER

PARISS OBSERVATORY
PARISS OBSERVATORY
PARISS OBSERVATORY
NASA-GSFC
NASA-GSFC
NATIONAL SCIENCE FOUND

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO MEASURE THE DIRECTION (2 ANGLES) OF TYPE III SOLAR BURSTS AT 24 FREQUENCIES STEPPED FROM 30 kHz TO 2 MHz. RELYING ON SOLAR ROTATION, ONE COULD OBTAIN THE 3-D MAP OF THE MAGNETIC LINES OF FORCE, WHICH GUIDE THE ELECTRONS THAT PRODUCE TYPE III SOLAR BURSTS FROM 10 SOLAR RADII TO 1 AU IN OR OUT OF THE ECLIPTIC. THE INSTRUMENT CONSISTED PRIMARILY OF TWO DIPOLE ANTENNAS AND A FOUR-CHANNEL RADIOMETER, WITH BANDWIDTHS OF 3 kHz AND 10 kHz. FREQUENCY SEQUENCE WAS 72 STEPS COVERING 10R S. SELF-CALIBRATION OCCURRED EVERY 18 H.

----- ISEE 3, STONE -----

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-12

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - E.C. STONE
OI - R.E. VOGT

CALIF INST OF TECH
CALIF INST OF TECH

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO STUDY THE ISOTOPIC CONSTITUTION OF SOLAR MATTER AND GALACTIC COSMIC-RAY SOURCES, THE PROCESSES OF NUCLEOSYNTHESIS IN THE SUN AND IN THE GALAXY, AND THE ASTROPHYSICAL PARTICLE ACCELERATION PROCESSED. THE FOLLOWING SPECIES WERE RESOLVED -- LITHIUM THROUGH NICKEL (Z FROM 3 THROUGH 28 AND A FROM 6 THROUGH 64) IN THE ENERGY RANGE FROM 5 TO 250 MEV/NUCLEON. THE MASS RESOLUTION WAS LESS THAN OR APPROXIMATELY EQUAL TO 0.3 U FOR Z LESS THAN OR EQUAL TO 30.

----- ISEE 3, TEEGARDEN -----

INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 78-079A-15

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - B.J. TEEGARDEN
OI - D.K. HOVEYSTADT
OI - T.L. CLINE
OI - G. GLOECKLER

NASA-GSFC
MPJ-EXTRATELL PHYS
NASA-GSFC
U OF MARYLAND

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO RECOGNIZE AND RECORD THE TIME HISTORY OF GAMMA-RAY BURSTS, AND TO PROVIDE HIGH-RESOLUTION SPECTRA OF GAMMA-RAY BURST PHOTONS BETWEEN 0.05 AND 6.5 MEV. THE DETECTORS WERE: (1) A 6 CM DIAM BY 3 CM THICK GERMANIUM CRYSTAL, RADIATIVELY COOLED TO OPERATE AT APPROXIMATELY 101 DEGREES K. ENERGY RESOLUTION WAS LESS THAN 3.5 KEV AT 1 MEV. A 4096-CHANNEL ADC DIGITIZED THE SIGNALS FOR INPUT TO THE GAMMA-BURST DIGITAL INSTRUMENTATION, WHICH WAS IN THE LOW-ENERGY COSMIC RAY EXPERIMENT, 78-079A-03; (2) THE CESIUM IODIDE AND SURROUNDING DETECTORS IN THE COSMIC RAY ELECTRONS AND NUCLEI EXPERIMENT, 78-079A-06. BOTH TEMPORAL AND SPECTRAL INFORMATION WERE OBTAINED FROM THIS DETECTOR; AND (3) A SMALLER CESIUM IODIDE CRYSTAL IN EXPERIMENT 78-079A-03. TWO TIME HISTORY MEMORIES OF 2000 12-BIT WORDS WERE USED, FED FROM ANY OF THE 3 DETECTORS BY COMMAND. THE STORED VALUES WERE TIME INTERVALS OVER WHICH A FIXED NUMBER (1-128) OF COUNTS WAS ACCUMULATED. THE TIME INTERVAL CLOCK FREQUENCY WAS SELECTABLE FROM 1 TO 8 kHz. SPECTRAL INFORMATION FROM EITHER OF DETECTORS (1) AND (2) WAS STORED IN A THIRD MEMORY OF 3072 16-BIT WORDS. TWELVE BITS WERE USED FOR PULSE HEIGHT DATA AND FOUR BITS FOR TIME. THE COUNTING RATES INPUT TO THE TIME HISTORY MEMORIES CAUSED A TRIGGER TO OCCUR IF RATES EXCEEDED A COMMANDABLE VALUE. WHEN THIS OCCURRED, ALL THREE MEMORIES WERE ALLOWED TO FILL. THEY COULD BE DUMPED AT A VERY LOW BIT RATE EITHER AUTOMATICALLY OR BY COMMAND.

----- ISEE 3, VON ROSENVINGE -----

INVESTIGATION NAME- MEDIUM ENERGY COSMIC RAY

NSSDC ID- 78-079A-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

**PERSONNEL**

PI - T.T. VON ROSENBERG	NASA-GSFC
OI - L.A. FISK	U OF NEW HAMPSHIRE
OI - F.B. MCDONALD	NASA-GSFC
OI - J.H. TRAINOR	NASA-GSFC
OI - M.A. VAN HOLLEBEKE	U OF MARYLAND

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO STUDY THE COMPOSITION OF SOLAR COSMIC RAYS FROM HYDROGEN THROUGH IRON AND THE ELEMENTAL ABUNDANCE OF GALACTIC COSMIC RAYS. THREE COSMIC RAY TELESCOPES, PLUS A PROPORTIONAL COUNTER FOR MEASUREMENT OF ELECTRONS AND X RAYS, COMPRISED THE INSTRUMENTATION. NUCLEI WITH Z BETWEEN 1 AND 30 WERE MEASURED IN VARIOUS ENERGY WINDOWS IN THE RANGE 1 TO 500 MEV/NUCLEON. UNIT MASS RESOLUTION WAS OBTAINED FOR ISOTOPES WITH Z EQUAL 1/2, AND 3 TO 7 IN THE ENERGY RANGES 4 TO 70, 1 TO 70, AND 30 TO 140 MEV/NUCLEON, RESPECTIVELY. ELECTRONS WERE MEASURED IN THE ENERGY RANGE APPROXIMATELY 2 TO 10 MEV. ANISOTROPY INFORMATION WAS OBTAINED FOR THE ELECTRONS AND NUCLEI WITH Z EQUAL 1 TO 26.

----- ISIS 1, BARRINGTON-----

**INVESTIGATION NAME** - GROUND BASED SOLAR STUDIES

**NSSDC ID** - 78-079A-13      **INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
SOLAR PHYSICS  
INTERPLANETARY MAGNETIC FIELDS

**PERSONNEL**

PI - J.P. WILCOX	STANFORD U
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**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF THE MEASUREMENT OF LARGE-SCALE SOLAR MAGNETIC AND VELOCITY FIELDS WITH THE STANFORD GROUND-BASED SOLAR TELESCOPE, AND THE COMPARISON OF THESE MEASUREMENTS WITH MEASUREMENTS OF THE INTERPLANETARY MAGNETIC FIELD AND SOLAR WIND MADE BY OTHER EXPERIMENTS ON THIS SPACECRAFT. THE PURPOSE OF THE EXPERIMENT WAS TO STUDY THE LARGE-SCALE STRUCTURE OF THE SOLAR MAGNETIC FIELD AND ITS EXTENSION INTO INTERPLANETARY SPACE BY THE SOLAR WIND.

\*\*\*\*\* ISIS 1 \*\*\*\*\*

**SPACECRAFT COMMON NAME** - ISIS 1  
**ALTERNATE NAMES** - ISIS-A, 03669

**NSSDC ID** - 69-009A

**LAUNCH DATE** - 01/30/69      **WEIGHT** - 241. KG  
**LAUNCH SITE** - VANDENBERG AFB, UNITED STATES  
**LAUNCH VEHICLE** - DELTA

**SPONSORING COUNTRY/AGENCY**

CANADA	CRC
UNITED STATES	NASA-OSS

**INITIAL ORBIT PARAMETERS**

ORBIT TYPE	GEOCENTRIC
ORBIT PERIOD	128.42 MIN
PERIAPSIS	578. KM ALT

EPOCH DATE - 02/04/69  
INCLINATION - 88.42 DEG  
APOAPSIS - 3526. KM ALT

**PERSONNEL**

MG - M.B. WEINREB	NASA HEADQUARTERS
MG - C.A. FRANKLIN	COMMUN RESEARCH CENTRE
PW - L.H. BRACE	NASA-GSFC
PS - L.H. BRACE	NASA-GSFC

**BRIEF DESCRIPTION**

ISIS 1 WAS AN IONOSPHERIC OBSERVATORY INSTRUMENTED WITH SWEEP- AND FIXED-FREQUENCY IONOSONDES, A VLF RECEIVER, ENERGETIC AND SOFT PARTICLE DETECTORS, AN ION MASS SPECTROMETER, AN ELECTROSTATIC PROBE, AN ELECTROSTATIC ANALYZER, A BEACON TRANSMITTER, AND A COSMIC NOISE EXPERIMENT. THE SOUNDER USED TWO DIPOLE ANTENNAS (73 AND 18.7 M LONG, RESPECTIVELY). THE SATELLITE WAS SPIN-STABILIZED AT ABOUT 2.0 RPM AFTER ANTENNA DEPLOYMENT. SOME CONTROL COULD BE EXERCISED OVER THE SPIN RATE AND ATTITUDE BY USING MAGNETICALLY INDUCED TORQUES TO CHANGE THE SPIN RATE AND TO PRECESS THE SPIN AXIS. A TAPE RECORDER WITH 1-H CAPACITY WAS INCLUDED ON THE SATELLITE. THE SATELLITE COULD BE PROGRAMMED TO TAKE RECORDED OBSERVATIONS FOR FOUR DIFFERENT TIME PERIODS FOR EACH FULL RECORDING PERIOD. THE RECORDER DATA WERE DUMPED ONLY AT OTTAWA. FOR NON-TAPE-RECORDED OBSERVATIONS, DATA FOR THE SATELLITE AND SUBSATELLITE REGIONS COULD BE ACQUIRED AND TELEMETERED WHEN THE SPACECRAFT WAS IN THE LINE OF SIGHT OF TELEMETRY SATIONS. THE SELECTED TELEMETRY STATIONS WERE IN AREAS THAT PROVIDED PRIMARY DATA COVERAGE NEAR THE 80 DEG W MERIDIAN AND IN AREAS NEAR HAWAII, SINGAPORE, AUSTRALIA, ENGLAND, NORWAY, INDIA, JAPAN, ANTARCTICA, NEW ZEALAND, AND CENTRAL AFRICA. NASA SUPPORT OF THE ISIS PROJECT WAS TERMINATED ON 1 OCTOBER 1979. A SIGNIFICANT AMOUNT OF EXPERIMENTAL DATA, HOWEVER, WAS ACQUIRED AFTER THIS DATE BY THE CANADIAN PROJECT TEAM.

----- ISIS 1, BARRINGTON-----

**INVESTIGATION NAME** - VLF RECEIVER

**NSSDC ID** - 69-009A-03

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - R.E. BARRINGTON	COMMUN RESEARCH CENTRE
OI - F.M. PALMER	COMMUN RESEARCH CENTRE

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT WAS TO STUDY NATURAL AND MANMADE VLF SIGNALS. SPECIFIC OBJECTIVES INCLUDED THE INVESTIGATION OF VLF PROPAGATION PHENOMENA, ION AND HYBRID PLASMA RESONANCES, AND CORRELATIONS BETWEEN VLF EMISSIONS AND INTENSE FLURES OF ENERGETIC PARTICLES. IN THIS EXPERIMENT AN ATTEMPT WAS MADE TO STIMULATE THE ION RESONANCES OF THE AMBIENT PLASMA BY USING SIGNALS FROM A VLF SWEEP-FREQUENCY EXCITER, CONTAINED WITHIN THE SPACECRAFT. THE INSTRUMENTATION CONSISTED OF A LOW-FREQUENCY, BROADBAND RECEIVER THAT SENSED SIGNALS RECEIVED BY THE 73 M DIPOLE (SPLIT MONPOLE) ANTENNA, BETWEEN 0.05 AND 30 KHZ. THIS SAME ANTENNA WAS USED FOR RECEIVING FREQUENCIES BELOW 5 MHZ ON THE JONOSONDE. THE RECEIVER HAD A WIDE DYNAMIC RANGE (80 DB) THAT WAS ACHIEVED BY USE OF AN AUTOMATIC GAIN CONTROL SYSTEM. THIS VLF EXPERIMENT INCLUDED AN OPTIONAL-USE ONBOARD EXCITER THAT OPERATED OVER A FREQUENCY CYCLE FROM 0 TO 0.3 TO 0 TO 11 TO 0 KHZ OVER A 3.2-S 'FRAME' PERIOD. THE FRAMES SEQUENCED THROUGH FOUR STEPS WHERE THE TRANSMISSIONS WERE ATTENUATED BY 0, 20, 20, THEN 40 DB, THUS REQUIRING 14 S FOR ONE COMPLETE CYCLE OF EXCITER OPERATION. THE EXCITER TRANSMITTED ON THE SHORT ANTENNAS AND THE RECEIVER SENSED THE SIGNALS COUPLED BETWEEN THE TWO ANTENNAS BY THE AMBIENT PLASMA, PLUS ANY NOISE SIGNALS WHICH WERE EXCITED IN THE PLASMA. THIS VLF EXPERIMENT ALSO PERMITTED ANTENNA IMPEDANCE MEASUREMENTS, WITH OR WITHOUT A DC BIAS ON THE ANTENNA. THE REAL-TIME DATA WERE TRANSMITTED ON 136.08-MHZ TELEMETRY. THE VLF DATA COULD BE RECORDED ON ONE OF THE FOUR TAPE RECORDER CHANNELS DURING THE TIME THE TAPE RECORDER OPERATED. TAPE-RECORDED (AND BACK-UP REAL-TIME) DATA WERE TRANSMITTED ON 400-MHZ TELEMETRY.

----- ISIS 1, BRACE-----

**INVESTIGATION NAME** - CYLINDRICAL ELECTROSTATIC PROBE

**NSSDC ID** - 69-009A-07

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
IONOSPHERES AND RADIO PHYSICS

**PERSONNEL**

PI - L.H. BRACE	NASA-GSFC
OI - J.A. FINDLAY	NASA-GSFC

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT WAS TO STUDY THE GLOBAL VARIATIONS OF ELECTRON TEMPERATURE AND ELECTRON CONCENTRATION AT SPACECRAFT (SC) ALTITUDES DURING SOLAR MAXIMUM, AND TO STUDY CHARACTERISTICS OF THE SC ION SHEATH. THE MEASUREMENTS WERE MADE WITH TWO CYLINDRICAL PROBES, OPERATING AS LANGMUIR PROBES. FROM THE PROBE CURRENT-VERSUS-VOLTAGE DATA, THE ELECTRON DENSITY AND ELECTRON TEMPERATURE COULD BE CALCULATED. THERE WAS A BOOM PROBE AND AN AXIAL PROBE. THE AXIAL PROBE EXTENDED 46.5 CM FROM THE SC ALONG THE SPIN AXIS, AND WAS CENTERED AMONG THE FOUR TELEMETRY ANTENNAS ON THE UNDERSIDE OF THE SC. THIS PROBE WAS CAPABLE OF MEASUREMENTS UNDISTURBED BY THE SATELLITE MOTION ONLY WHEN THE PROBE PRECEDED THE SC IN ITS MOTION THROUGH THE PLASMA. THE BOOM PROBE EXTENDED HORIZONTALLY AND OUTWARD (IN SC FRAME OF REFERENCE) FROM A BOOM 1 M LONG, WHICH IN TURN EXTENDED FROM AN UPPER SURFACE OF THE SATELLITE AT AN ANGLE OF ABOUT 45 DEG TO THE SPIN AXIS. THIS PROBE PROVIDED SOME OBSERVATIONS DURING EACH SC SPIN CYCLE THAT WAS FREE OF SC WAKE EFFECTS. THE PROBES CONSISTED OF THREE CONCENTRIC, ELECTRICALLY ISOLATED, STAINLESS STEEL TUBES. THE OUTER (0.24-CM DIAM AND 23-CM LONG) TUBE FLOATED AT ITS OWN EQUILIBRIUM POTENTIAL AND SERVED TO PLACE THE COLLECTOR WELL AWAY FROM THE SC PLASMA SHEATH. THE CENTER TUBE (0.165-CM DIAM) EXTENDING 23 CM OUTWARD FROM THE OUTER TUBE ACTED AS AN ELECTRICAL GUARD FOR THE COLLECTOR. ITS ELECTRICAL POTENTIAL WAS CONTROLLED. THE COLLECTOR (0.058-CM DIAM) EXTENDED 23 CM OUTWARD FROM THE DRIVEN GUARD. DURING EACH 2-MIN SEQUENCE, A VOLT-AMPERE CURVE WAS OBTAINED FROM THE SAWTOOTH VOLTAGE (-2 TO +10V) APPLIED TO THE COLLECTOR. THIS CAN BE INTERPRETED IN ELECTRON DENSITIES OVER A RANGE FROM 1.62 TO 1.56 ELECTRONS PER CUBIC CM, AND TEMPERATURES FROM ABOUT 400 TO 50,000 DEG K.

----- ISIS 1, CALVERT-----

**INVESTIGATION NAME** - FIXED-FREQUENCY SOUNDER

**NSSDC ID** - 69-009A-02

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
IONOSPHERES AND RADIO PHYSICS

ORIGINAL PAGE IS  
OF POOR QUALITY.

**PERSONNEL**

PI - W. CALVERT	LOCKHEED PALO ALTO
OI - R.B. NORTON	NOAA-ERL
OI - J.M. WARNOCK	NOAA
OI - J.H. WHITTEKER	COMMUN RESEARCH CENTRE
OI - C.E. PETRIE	COMMUN RESEARCH CENTRE

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO STUDY IONOSPHERIC FEATURES OF A SMALLER SCALE THAN COULD BE DETECTED BY THE SWEEP SOUNDER, AND TO STUDY PLASMA RESONANCES. PARAMETERS MEASURED WERE VIRTUAL RANGE (A FUNCTION OF PROPAGATION TIME OF THE REFLECTED PULSE) AND TIME. THESE DATA WERE NORMALLY OBSERVED ONLY WHEN THE SPACECRAFT WAS IN RANGE OF A TELEMETRY STATION. THE FIXED-FREQUENCY SOUNDER OPERATED FROM THE SAME ANTENNA, TRANSMITTER, AND RECEIVER USED FOR THE SWEEP-FREQUENCY EXPERIMENT. IT NORMALLY OPERATED FOR 5 S DURING THE FREQUENCY FLYBACK PERIOD OF THE SWEEP-FREQUENCY OPERATION THAT WAS EVERY 19 OR 29 S. ONE OF SIX FREQUENCIES (0.25, 0.48, 1.00, 1.95, 4.00, OR 9.305 MHZ) WAS CHOSEN FOR USE BY THE EXPERIMENTER AS DESIRED. OTHER MODES OF OPERATION WERE AVAILABLE, INCLUDING CONTINUOUS OBSERVATION AT A SELECTED FREQUENCY, AND A SPECIAL MIXED MODE WITH TRANSMISSION AT THE FIXED FREQUENCY OF 0.82 MHZ AND SWEEP RECEPTION.

----- ISIS 1, HARTZ-----

INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 69-009A-10

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
IONOSPHERES AND RADIO PHYSICS

**PERSONNEL**

PI - T.R. HARTZ

COMMUN RESEARCH CENTRE

**BRIEF DESCRIPTION**

THIS EXPERIMENT USED THE SWEEP FREQUENCY IONOSONDE RECEIVER AUTOMATIC GAIN CONTROL (AGC) VOLTAGES TO MEASURE GALACTIC AND SOLAR RADIO NOISE LEVELS. THE RECEIVER SWEEPED FROM 0.1 TO 20 MHZ. THE DYNAMIC RANGE WAS 50 DB, AND THE BANDWIDTH WAS 55 KHZ. THE ANTENNAS USED WERE 18.7-M AND 73-M DIPOLES.

----- ISIS 1, MCDIARMID-----

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 69-009A-04

INVESTIGATIVE PROGRAM  
CCDE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - I.B. MCDIARMID  
OI - J.R. BURROWS  
OI - R.C. ROSE

NATL RES COUNC OF CAN  
NATL RES COUNC OF CAN  
NATL RES COUNC OF CAN

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT WAS TO PROVIDE DATA THAT WILL AID IN UNDERSTANDING (1) THE MECHANISMS RESPONSIBLE FOR THE PRODUCTION AND CONTROL OF THE OUTER RADIATION ZONE, (2) THE RELATED PROBLEMS OF PARTICLE ENTRY INTO THE EARTH'S MAGNETIC FIELD, AND (3) INTERACTIONS BETWEEN THE EARTH'S MAGNETOSPHERE AND THE SOLAR WIND. THIS EXPERIMENT CONSISTED OF FOUR SETS OF DETECTORS. THE FIRST SET, COMPRISING FOUR GEIGER COUNTERS, MEASURED ELECTRONS GREATER THAN 20 AND 40 KEV AND PROTONS GREATER THAN 300 AND 500 KEV PARALLEL AND PERPENDICULAR TO THE SATELLITE SPIN AXIS. ALL REMAINING DETECTORS MEASURED PARTICLES PERPENDICULAR TO THE SPIN AXIS. THE SECOND SET CONSISTED OF SOLID-STATE SILICON JUNCTION DETECTORS. THESE RESPONDED TO ELECTRONS GREATER THAN 25 AND 140 KEV, ELECTRONS IN THE RANGE 200 TO 770 KEV, AND PROTONS GREATER THAN 200 AND 400 KEV. THE THIRD SET CONSISTED OF FIVE SILICON JUNCTION DETECTORS THAT RESPONDED TO PROTONS BETWEEN 0.15 AND 30 MEV. THE FOURTH SET CONSISTED OF CESIUM IODIDE SCINTILLATION-PHOTOMULTIPLIER SYSTEMS. EACH SYSTEM OPERATED IN TWO MODES AND RESPONDED TO ELECTRONS GREATER THAN 8, 40, AND 60 KEV AND PROTONS GREATER THAN 50 KEV AND IN THE RANGE 50 TO 70 KEV.

----- ISIS 1, SAGALYN-----

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ANALYZER

NSSDC ID- 69-009A-05

INVESTIGATIVE PROGRAM  
CCDE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - R.C. SAGALYN  
OI - W. SMIDDY

USAF GEOPHYS LAB  
USAF GEOPHYS LAB

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THE SPHERICAL ELECTROSTATIC ANALYZER EXPERIMENT WAS TO MEASURE THE TEMPORAL AND SPATIAL VARIATIONS IN THE CONCENTRATION AND ENERGY DISTRIBUTION OF THE CHARGED PARTICLES THROUGHOUT THE ORBIT. SPECIFICALLY, THE OBJECTIVES WERE TO MEASURE THE FOLLOWING PARAMETERS -- (A) THE DENSITY OF POSITIVE IONS HAVING THERMAL ENERGY IN THE CONCENTRATION RANGE FROM 1.1E1 TO 1.2E1 IONS PER CUBIC CM, (B) THE KINETIC TEMPERATURE OF THE THERMAL IONS IN THE RANGE FROM 700 TO 4000 DEG K, (C) THE FLUX AND ENERGY SPECTRUM OF PROTONS IN THE RANGE FROM 0 TO 2 KEV, AND (D) THE SATELLITE POTENTIAL WITH RESPECT TO THE UNDISTURBED PLASMA. TWO UNITS MADE UP THE EXPERIMENT PACKAGE -- A 96-CM BOOM THAT SUPPORTED THE SENSOR AND MADE POSSIBLE OMNIDIIRECTIONAL MEASUREMENTS, AND AN ELECTRONICS PACKAGE (CONSIDERED TO INCLUDE THE SENSOR) TO PERFORM THE MEASUREMENTS AND TO PROCESS THE DATA INTO A SUITABLE FORM FOR TELEMETRY. THE SENSOR WAS MADE UP OF THREE CONCENTRIC SPHERICAL MESHED GRIDS HAVING RADII OF 3.18, 2.54, AND 1.90 CM. THE INNERMOST GRID WAS THE COLLECTOR. THESE GRIDS WERE MADE FROM TUNGSTEN MESH AND HAD A TRANSPARENCY OF 80 TO 90 PERCENT. TO MEASURE THE PARAMETERS LISTED ABOVE, SUITABLE SWEEP AND STEP VOLTAGES WERE APPLIED TO THE GRIDS. THIS INSTRUMENT WAS OPERATED IN SEVERAL MODES. THE ION DENSITIES WERE SAMPLED 60 TIMES A SECOND, CORRESPONDING TO A SPATIAL RESOLUTION OF 150 M. ONCE PER MIN THE RATIO OF MASS TO TEMPERATURE WAS SAMPLED, AND THE ENERGY DISTRIBUTION WAS SAMPLED ONCE EVERY 2 MIN.

----- ISIS 1, WHITTEKER-----

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 69-009A-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-UP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS

**PERSONNEL**

PI - J.H. WHITTEKER  
OI - J.E. JACKSON  
OI - J. TURNER  
OI - M. SYLVAIN  
OI - O. HOLT  
OI - T. CGATA  
OI - R. RAGHAVARAO  
OI - R.R. NORTON  
OI - C.E. PETRIE  
OI - K.L. CHAN  
OI - R.S. UNWIN

COMMUN RESEARCH CENTRE  
NASA-GSFC  
IONOSPHERIC PRED SERV  
LGF  
AURORAL OPS  
RADIO RESEARCH LAB  
PHYSICAL RESEARCH LAB  
NOAA-ERL  
COMMUN RESEARCH CENTRE  
NASA-ARC  
DEPT OF SCI+INDUST RES

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT WAS TO INVESTIGATE THE IONOSPHERIC ELECTRON DENSITY IN THE ALTITUDE RANGE 300 TO 2500 KM FOR A FULL SOLAR CYCLE (BY COMBINING THE ISIS 1 MEASUREMENTS WITH THE ALOUETTE 2 DATA). ANOTHER IMPORTANT FUNCTION OF THE SOUNDER WAS TO PROVIDE CORRELATIVE DATA FOR THE OTHER ISIS 1 EXPERIMENTS, PARTICULARLY THOSE MEASURING IONOSPHERIC PARAMETERS. THE ISIS 1 IONOSONDE WAS A RADIO TRANSMITTER/RECEIVER THAT RECORDED THE TIME DELAY BETWEEN A TRANSMITTED AND A RETURNED RADIO FREQUENCY PULSE. A CONTINUUM OF FREQUENCIES BETWEEN 0.1 AND 20 MHZ WAS SAMPLED ONCE EVERY 19 OR 29 S, AND ONE OF SIX SELECTED FREQUENCIES WAS ALSO SOUNDED FOR A PERIOD OF 3 TO 5 S DURING THIS 19- OR 29-S PERIOD. IN ADDITION TO THE SWEEP- AND FIXED-FREQUENCY MODES OF OPERATION, A MIXED MODE WAS POSSIBLE WHERE THE TRANSMITTER FREQUENCY WAS FIXED AT 0.82 MHZ WHILE THE RECEIVER SWEEPED. SEVERAL VIRTUAL HEIGHT (DELAY TIME) TRACES WERE NORMALLY OBSERVED DUE TO GROUND REFLECTIONS, PLASMA RESONANCES, BIREFRINGENCE OF THE IONOSPHERE, NONVERTICAL PROPAGATION, ETC. VIRTUAL HEIGHT AT A GIVEN FREQUENCY WAS PRIMARILY A FUNCTION OF DISTANCE TRAVELED BY THE SIGNAL, ELECTRON DENSITY ALONG THE PROPAGATION PATH, AND MODE OF PROPAGATION. THE STANDARD DATA FORMAT WAS AN IONGRAM SHOWING VIRTUAL HEIGHT AS A FUNCTION OF FREQUENCY.

\*\*\*\*\* ISIS 2 \*\*\*\*\*

SPACECRAFT COUNTRY NAME- ISIS 2  
ALTERNATE NAMES- ISIS-B, PL-701F  
05104

NSSDC ID- 71-024A

LAUNCH DATE- 04/01/71  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

WEIGHT- 256. KG

SPONSORING COUNTRY/AGENCY  
CANADA  
UNITED STATES

CRC  
NASA-CSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 113.6 MIN  
PERIASTRIS- 1358. KM ALT

EPOCH DATE- 04/02/71  
INCLINATION- 28.1 DEG  
APOASTRIS- 1426. KM ALT

PERSONNEL  
MG - M.D. WEINREH  
SC - E.R. SCHWERTLING  
PM - C.A. FRANKLIN  
PM - L.H. BRACE  
PS - L.H. BRACE

NASA HEADQUARTERS  
NASA HEADQUARTERS  
COMMUN RESEARCH CENTRE  
NASA-GSFC  
NASA-GSFC

**BRIEF DESCRIPTION**

ISIS 2 WAS AN IONOSPHERIC OBSERVATORY INSTRUMENTED WITH A SWEEP AND A FIXED-FREQUENCY IONOSONDE, A VLF RECEIVER, ENERGETIC AND SOFT PARTICLE DETECTORS, AN ION MASS SPECTROMETER, AN ELECTROSTATIC PACB, A RETARDING POTENTIAL ANALYZER, A BEACON TRANSMITTER, A COSMIC NOISE EXPERIMENT, AND TWO PHOTOMETERS. THE SOUNDER USED TWO LONG CROSSED-DIPOLE ANTENNAS (73 AND 16.7 M LONG) FOR THE SOUNDING, VLF, AND COSMIC NOISE EXPERIMENTS. THE SPACECRAFT WAS SPIN-STABILIZED TO ABOUT 2 RPM AFTER ANTENNA DEPLOYMENT. THERE WERE TWO BASIC ORIENTATION MODES FOR THE SPACECRAFT, CARTWHEEL AND ORBIT-ALIGNED. THE SPACECRAFT OPERATED APPROXIMATELY THE SAME LENGTH OF TIME IN EACH MODE, REMAINING IN ONE MODE TYPICALLY 3 TO 5 MO. THE CARTWHEEL MODE WITH THE AXIS PERPENDICULAR TO THE ORBIT PLANE WAS MADE AVAILABLE TO PROVIDE RAM AND WAKE DATA FOR SOME EXPERIMENTS FOR EACH SPIN PERIOD, RATHER THAN EACH ORBIT PERIOD. ATTITUDE AND SPIN INFORMATION WAS OBTAINED FROM A THREE-AXIS MAGNETOMETER AND A SUN SENSOR. CONTROL OF ATTITUDE AND SPIN WAS POSSIBLE BY MEANS OF MAGNETIC TORQUING. THE EXPERIMENT PACKAGE ALSO INCLUDED A PROGRAMMABLE TAPE RECORDER WITH A 1-H CAPACITY. FOR NONRECORDED OBSERVATIONS, DATA FROM SATELLITE AND SUBSATELLITE LOCATIONS WERE TELEMETERED WHEN THE SPACECRAFT WAS IN LINE OF SIGHT OF A TELEMETRY STATION. TELEMETRY STATIONS WERE LOCATED SO THAT PRIMARY DATA COVERAGE WAS NEAR THE 80 DEG W MERIDIAN AND NEAR HAWAII, SINGAPORE, AUSTRALIA, ENGLAND, FRANCE, NORWAY, INDIA, JAPAN, ANTARCTICA, NEW ZEALAND, AND CENTRAL AFRICA. NASA SUPPORT OF THE ISIS PROJECT WAS TERMINATED ON 1 OCTOBER 1979. A SIGNIFICANT AMOUNT OF EXPERIMENTAL DATA, HOWEVER, WAS ACQUIRED AFTER THIS DATE BY THE CANADIAN PROJECT TEAM.

## ----- ISIS 2, CALVERT -----

## INVESTIGATION NAME- FIXED-FREQUENCY SOUNDER

NSSDC ID- 71-024A-02      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS

## PERSONNEL

PI - W. CALVERT  
OI - R.B. NORTON  
OI - C.E. PETRIE  
OI - J.H. WHITTEKER  
OI - J.M. WARNOCK

LOCKHEED PALO ALTO  
NOAA-ERL  
COMMUN RESEARCH CENTRE  
COMMUN RESEARCH CENTRE  
NOAA

## BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO STUDY IONOSPHERIC FEATURES OF A SMALLER SCALE THAN COULD BE DETECTED BY THE SWEEP SOUNDER AND TO STUDY PLASMA RESONANCES. PARAMETERS MEASURED WERE VIRTUAL RANGE (A FUNCTION OF PROPAGATION TIME OF THE PULSE) AND TIME. THESE DATA WERE NORMALLY OBSERVED ONLY WHEN THE SPACECRAFT WAS IN RANGE OF A TELEMETRY STATION. THE FIXED-FREQUENCY SOUNDER OPERATED FROM THE SAME ANTENNA, TRANSMITTER, AND RECEIVER USED FOR THE SWEEP-FREQUENCY EXPERIMENT. IT NORMALLY OPERATED FOR 3 TO 5 S DURING THE FREQUENCY FLYBACK PERIOD OF THE SWEEP-FREQUENCY OPERATION WHICH WAS EVERY 14 OR 21 S. ONE OF SIX FREQUENCIES (0.12, 0.46, 1.00, 1.95, 4.00, OR 4.303 MHZ) WAS CHOSEN FOR USE BY THE EXPERIMENTER, AS DESIRED. OTHER MODES OF OPERATION WERE AVAILABLE INCLUDING CONTINUOUS OBSERVATION AT A SELECTED FREQUENCY AND A SPECIAL MIXED MODE WITH TRANSMISSION AT A SELECTED ONE OF THE SIX FIXED FREQUENCIES AND SWEEP RECEPTION.

## ----- ISIS 2, HARTZ -----

## INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 71-024A-10      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
IONOSPHERES AND RADIO PHYSICS

## PERSONNEL

PI - T.R. HARTZ

COMMUN RESEARCH CENTRE

## BRIEF DESCRIPTION

THIS EXPERIMENT USED THE SWEEP FREQUENCY IONOSONDE RECEIVER AUTOMATIC GAIN CONTROL (AGC) VOLTAGES TO MEASURE GALACTIC AND SOLAR RADIO NOISE LEVELS. THE RECEIVER SWEEP FROM 0.1 TO 20 MHZ, THE DYNAMIC RANGE WAS 50 DB, AND THE BANDWIDTH WAS 55 KHZ. THE ANTENNAS USED WERE 16.7-M AND 73-M DIPOLES.

## ----- ISIS 2, HOFFMAN -----

## INVESTIGATION NAME- ION-MASS SPECTROMETER

NSSDC ID- 71-024A-06      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

## PERSONNEL

PI - J.H. HOFFMAN

U OF TEXAS, DALLAS

## BRIEF DESCRIPTION

THIS MAGNETIC ION-MASS SPECTROMETER EXPERIMENT WAS FLown TO MEASURE THE DISTRIBUTION OF THE CONCENTRATIONS OF THE POSITIVE ION SPECIES AS A FUNCTION OF TIME AND POSITION, WITH PARTICULAR INTEREST FOCUSED ON THE POLAR WIND PARTICLES. THE INSTRUMENT HAD TWO ION DETECTOR SYSTEMS, AND MASS SCANNING THROUGH THE RANGE FROM 1 TO 64 AMU WAS ACCOMPLISHED IN TWO SECTIONS -- 1 TO 8 U AND B TO 64 U. TWO ION BEAMS EMERGED FROM THE MAGNETIC SECTOR OF THE INSTRUMENT AND WERE SIMULTANEOUSLY DETECTED BY ELECTRON MULTIPLIERS AND LOG ELECTROMETER AMPLIFIERS. A CIRCUIT FOLLOWING EACH AMPLIFIER DETECTED THE PEAK AMPLITUDE OF THE ION CURRENT. THIS PEAK VALUE, RATHER THAN THE ENTIRE MASS SPECTRUM, WAS TRANSMITTED IN ORDER TO REDUCE THE REQUIRED TELEMETRY BANDWIDTH. IN THIS MODE OF OPERATION, THE COMPLETE MASS RANGE WAS SCANNED IN 1 S. A BACKUP MODE WAS PROVIDED THAT PRODUCED AN ANALOG OUTPUT WITH A SWEEP PERIOD OF 6 S. THIS EXPERIMENT OPERATED NOMINALLY AFTER LAUNCH WITH MOST OF THE DATA OBTAINED IN THE PEAK MODE AND WHILE THE SATELLITE OPERATED IN THE CARTWHEEL MODE, FOR ABOUT 2 MIN PER PASS OVER OTTAWA, CANADA. THE EXPERIMENT OPERATED IN THE ANALOG MODE. IN-FLIGHT CALIBRATION WAS ACHIEVED BY COMPARING ION CONCENTRATION MEASUREMENTS AT APPROPRIATE ALTITUDES, I.E., WHERE A SINGLE ION SPECIES PREDOMINATED, WITH ELECTRON DENSITY DATA FROM THE SOUNDER ON BOARD. OTHER COMPARISONS WERE MADE

## ----- ISIS 2, BARRINGTON -----

## INVESTIGATION NAME- VLF RECEIVER

NSSDC ID- 71-024A-03      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS

## PERSONNEL

PI - R.E. BARRINGTON  
OI - F.H. PALMER

COMMUN RESEARCH CENTRE  
COMMUN RESEARCH CENTRE

## BRIEF DESCRIPTION

THE PURPOSE OF THIS EXPERIMENT WAS TO STUDY NATURAL AND MANMADE VLF SIGNALS. SPECIFIC OBJECTIVES INCLUDED THE INVESTIGATION OF VLF PROPAGATION PHENOMENA, ION AND HYBRID PLASMA RESONANCES, AND CORRELATIONS BETWEEN VLF EMISSIONS AND INTENSE FLUXES OF ENERGETIC PARTICLES. IN THIS EXPERIMENT A SWEEP-FREQUENCY EXCITER, COVERING THE RANGE 15 TO 0.05 MHZ IN 1.0 S, WAS USED TO STIMULATE ION-RESONANCES IN THE PLASMA. THE INSTRUMENTATION CONSISTED OF A LOW-FREQUENCY BROADBAND RECEIVER THAT OBSERVED SIGNALS FROM THE 73-M LONG DIPOLE (SPLIT MONPOLE) ANTENNA BETWEEN 0.05 AND 30 MHZ. THIS SAME ANTENNA WAS USED FOR RECEIVING SIGNALS BELOW 5 MHZ ON THE IONOSONDE.

BETWEEN THE SPECTROMETER OUTPUT AND MEASUREMENTS OBTAINED FROM OTHER RELATED EXPERIMENTS ON BOARD.

----- ISIS 2, MAIER-----

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 71-024A-08

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES

PERSONNEL

PI - E.J. MAIER  
OI - R.E. TROY, JR.  
OI - J.L. DONLEY

NASA-GSFC  
US NAVAL RESEARCH LAB  
NASA-GSFC

BRIEF DESCRIPTION

THE PRIMARY OBJECTIVE OF THIS EXPERIMENT WAS TO MEASURE THE POSITIVE ION DENSITY, COMPOSITION, AND TEMPERATURE IN VICINITY OF THE SPACECRAFT. A SECONDARY OBJECTIVE WAS TO MEASURE THE THERMAL ELECTRON DENSITY AND TEMPERATURE, AND THE FLUX OF SUPRATHERMAL ELECTRONS. THIS RETARDING POTENTIAL ANALYZER CONSISTED OF THREE GRIDS (APERTURE GRID, RETARDING GRID AND A SUPPRESSOR GRID) THAT PROVIDED A VOLT-AMPERE CURVE RELATING SWEEP VOLTAGE ON THE RETARDING GRID TO CURRENT FLOW TO THE COLLECTOR. ANALYSIS OF THE VOLT-AMPERE CURVES PROVIDED ION/ELECTRON TEMPERATURES AND DENSITIES. THIS EXPERIMENT WAS DESIGNED TO OPERATE ONLY WITH THE SATELLITE IN A CARTWHEEL MODE OF OPERATION. IN THIS MODE, THE SPIN AXIS IS PERPENDICULAR TO THE ORBIT PLANE. THIS ALLOWS THE ANALYZER APERTURE TO FACE THE DIRECTION OF SATELLITE MOTION ONCE EACH SPIN PERIOD.

----- ISIS 2, MEDIARMID-----

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 71-024A-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PARTICLES AND FIELDS

PERSONNEL

PI - I.B. MEDIARMID  
OI - J.R. BURROWS

NATL RES COUNC OF CAN  
NATL RES COUNC OF CAN

BRIEF DESCRIPTION

THE OBJECTIVES OF THE ENERGETIC PARTICLE EXPERIMENT WERE TO PROVIDE DATA THAT WOULD AID IN THE UNDERSTANDING OF: (1) THE MECHANISMS RESPONSIBLE FOR THE PRODUCTION AND CONTROL OF THE OUTER RADIATION ZONES; (2) THE RELATED PROBLEM OF SOLAR-FLARE PARTICLE ENTRY INTO THE EARTH'S MAGNETIC FIELDS; AND (3) INTERACTIONS BETWEEN THE EARTH'S MAGNETOSPHERE AND THE SOLAR WIND. THIS EXPERIMENT CONSISTED OF FOUR SETS OF DETECTORS. THE FIRST SET CONSISTED OF THREE GEIGER COUNTERS (OF WHICH ONE FAILED AFTER LAUNCH) AND MEASURED ELECTRONS GREATER THAN 20 AND 40 KEV PERPENDICULAR AND PARALLEL TO THE SPIN AXIS. THESE GEIGER COUNTERS WERE ALSO SENSITIVE TO PROTONS WITH ENERGIES GREATER THAN 200 AND 600 KEV, RESPECTIVELY. ALL REMAINING DETECTORS MEASURED PARTICLES PERPENDICULAR TO THE SPIN AXIS. THE SECOND SET CONSISTED OF TWO SOLID-STATE SILICON JUNCTION DETECTORS. BOTH DETECTORS WERE OPERATED IN LOW- AND HIGH-THRESHOLD MODE, WHILE ONE COULD ADDITIONALLY BE SWITCHED TO ANOTHER DISCRIMINATION LEVEL. THEY MEASURED ELECTRONS WITH ENERGIES GREATER THAN 40, 60, 90, 120, 150, AND 200 KEV. THEY WERE ALSO SENSITIVE TO PROTONS WITH ENERGIES GREATER THAN 150, 200, AND 750 KEV. THE SWITCHABLE DETECTOR EXPERIENCED CONTINUOUS SATURATION. THE THIRD SET CONSISTED OF THREE SILICON JUNCTION DETECTORS THAT MEASURED PROTONS IN THE ENERGY RANGES 0.8 TO 4.0, 3.2 TO 12.7, AND 12.9 TO 28.0 MEV, ALPHA PARTICLES IN THE ENERGY RANGE 2.0 TO 16.0 MEV, AND ELECTRONS IN THE ENERGY RANGE 1.0 TO 2.0 MEV. THE FOURTH SET WAS COMPOSED OF TWO CESIUM IODIDE SCINTILLATION-PHOTOMULTIPLIER SYSTEMS (CHANNELTRONS WITH CYLINDRICAL ELECTROSTATIC ANALYZERS) STEPPED THROUGH EIGHT ENERGIES IN 60/60 OF A SECOND. THESE DIFFERENTIAL SPECTROMETERS MEASURED ELECTRONS AT 9.6, 7.8, 6.0, 4.1, 3.0, 2.2, 1.3, AND 0.15 KEV, AND MEASURED PROTONS AT 26.2, 21.6, 17.0, 12.4, 9.4, 7.6, 5.2, AND 2.2 KEV.

----- ISIS 2, SHEPHERD-----

INVESTIGATION NAME- 6300-A PHOTOMETER

NSSDC ID- 71-024A-12

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - G.G. SHEPHERD

YORK U

BRIEF DESCRIPTION

A TWO-CHANNEL PHOTOMETER WAS USED TO MEASURE DIRECTLY AND TO MAP THE INTENSITY OF THE ATOMIC OXYGEN RED LINE AT 6300 Å IN DAY, TWILIGHT, AND NIGHT AIRGLOW AND AURORA. EACH CHANNEL HAD ITS OWN OPTICAL INPUT, AND THE TWO INPUTS WERE MOUNTED AT THE SAME END OF THE SPACECRAFT, SEPARATED BY 180 DEG, WITH THEIR AXES AT 90 DEG TO THE SPACECRAFT'S SPIN AXIS. ONE OPTICAL INPUT WAS CHARACTERIZED BY A SPECTRAL BANDWIDTH OF 12 Å CENTERED AROUND THE 6300-Å LINE OF ATOMIC OXYGEN, AND THE OTHER INPUT WAS USED FOR WHITE LIGHT MEASUREMENTS. THE SPINNING SATELLITE CAUSED THE PHOTOMETER TO ALTERNATELY VIEW THE EARTH AND THEN THE SKY, I.E., WHEN ONE SENSOR VIEWED THE EARTH, THE OTHER SENSOR SAW THE SKY. BOTH SENSORS HAD A 2.5-DEG CIRCULAR FIELD OF VIEW. WITH THE USE OF A BEAM-COMBINER ARRANGEMENT, THE SAME PHOTOMULTIPLIER ACCEPTED THE TWO INPUTS. THE DYNAMIC RANGE OF INTENSITY MEASUREMENTS WAS FROM ABOUT 1.111 PHOTONS PER 50 M PER S (10 RADIATIONS) TO MORE THAN 1.111 PHOTONS PER 50 M PER S. SUNLIGHT COULD ENTER THE OPTICAL SYSTEMS DIRECTLY IN ADDITION TO EARTH-REFLECTED LIGHT. THE INSTRUMENT BAFFLE WAS ILLUMINATED BY THE SUN ONLY FOR THE OFF-AXIS ANGLES LESS THAN 47 DEG. OUTSIDE THIS LIMIT, THE DATA WERE NOT DEGRADED BY SUNLIGHT, PERMITTING NORMAL OPERATION IN THE REGION OF THE ORBIT WHERE THE SPACECRAFT WAS IN SUNLIGHT, BUT THE PORTION OF THE EARTH BENEATH IT WAS DARK. AN EXTERNAL LIGHT SOURCE 'SAW' THE FILTER ONLY WHEN IT WAS 7.5 DEG OR LESS OFF AXIS. IN THE RANGE 7.5 TO 47 DEG, GOOD DATA WERE STILL OBTAINED WHEN THE SUNLIT EARTH WAS THE ORIGIN OF THE CONTAMINATION. TO PERFORM THE DATA ANALYSIS, IT WAS NECESSARY, AMONG OTHER OPERATIONS, TO EVALUATE DIFFERENT GEOMETRICAL SITUATIONS, AND TO LOCATE THE ON-EARTH LIMB CROSSING OF THE 12-Å BANDPASS PHOTOMETER SO THAT THE DATA COULD BE ORGANIZED INTO SPIN MAPS. FOR MORE DETAILS SEE, 'ISIS-2 ATOMIC OXYGEN RED LINE PHOTOMETER,' G.G. SHEPHERD, ET AL, 'APPLIED OPTICS,' 12, A, 1767-1774, AUGUST 1973.

----- ISIS 2, WHITTEKER-----

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 71-024A-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - J.H. WHITTEKER  
OI - J. TURNER  
OI - M. SYLVAIN  
OI - O. HOLT  
OI - V. OGATA  
OI - R. RAGHAVARAO  
OI - J.E. JACKSON  
OI - L.E. PETRIE  
OI - H.B. NORTON  
OI - K.L. CHAN  
OI - R.S. UNWIN

COSTAN RESEARCH CENTRE  
IONOSPHERIC PREV SERV  
LGE  
AURORAL OBS  
RADIO RESEARCH LAB  
PHYSICAL RESEARCH LAB  
NASA-GSFC  
COSTAN RESEARCH CENTRE  
NOAA-ERL  
NASA-ARC  
DEPT OF SCI+INDUST RES

BRIEF DESCRIPTION

THE PURPOSE OF THIS EXPERIMENT WAS TO MEASURE THE IONOSPHERIC ELECTRON DENSITY IN THE ALTITUDE RANGE 300 TO 1400 KM. ANOTHER IMPORTANT FUNCTION OF THE SOUNDER WAS TO PROVIDE CORRELATIVE DATA FOR THE OTHER ISIS 2 EXPERIMENTS, PARTICULARLY THOSE MEASURING IONOSPHERIC PARAMETERS. THE ISIS 2 IONOSONDE WAS A RADIO TRANSMITTER THAT RECORDED THE TIME DELAY BETWEEN A TRANSMITTED AND RETURNED RADIO FREQUENCY PULSE. A CONTINUUM OF FREQUENCIES BETWEEN 0.1 AND 20 MHZ WAS SAMPLED EVERY 14 OR 21 S, AND ONE OF SIX SELECTED FREQUENCIES WAS ALSO USED FOR SOUNDING FOR A FEW SECONDS DURING EACH 14- OR 21-S PERIOD. IN ADDITION TO THE SWEEP- AND FIXED-FREQUENCY MODES OF OPERATION, A MIXED MODE WAS AVAILABLE IN WHICH THE TRANSMITTER FREQUENCY WAS FIXED AT ONE OF SIX POSSIBLE FREQUENCIES WHILE THE RECEIVER SWEEPED. SEVERAL VIRTUAL RANGE (DELAY TIME) TRACES RESULTING FROM GROUND REFLECTIONS, PLASMA RESONANCES, BIREFRINGENCE OF THE IONOSPHERE, NONVERTICAL PROPAGATION, ETC., WERE NORMALLY OBSERVED. VIRTUAL RANGE AT A GIVEN FREQUENCY WAS PRIMARILY A FUNCTION OF DISTANCE TRAVELED BY THE SIGNAL, ELECTRON DENSITY ALONG THE PROPAGATION PATH, AND MODE OF PROPAGATION. THE STANDARD DATA FORMAT WAS AN IONOGRAM (GRAPH) SHOWING VIRTUAL RANGE AS A FUNCTION OF RADIC FREQUENCY.

\*\*\*\*\* 155-B\*\*\*\*\*

SPACECRAFT COMMON NAME- ISS-R  
ALTERNATE NAMES- IONOSP SOUNDING SAT 2, 10674  
UME 2, ISS-2

NSSDC ID- 78-018A

LAUNCH DATE- 02/16/78  
LAUNCH SITE- YAGASHTIMA, JAPAN  
LAUNCH VEHICLE- MU

WEIGHT- 135. KG

SPONSORING COUNTRY/AGENCY  
JAPAN

RRL

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 107. MIN  
PERIAPSIS- 972. KM ALT

EPOCH DATE- 02/17/78  
INCLINATION- 69.4 DEG  
APOAPSIS- 1225. KM ALT

PERSONNEL  
PI - N. WAKAI  
PS - N. MATUURA

RADIO RESEARCH LAB  
RADIO RESEARCH LAB

BRIEF DESCRIPTION

THE IONOSPHERE SOUNDING SATELLITE (ISS) WAS PART OF JAPAN'S CONTRIBUTION TO THE INTERNATIONAL MAGNETOSPHERIC STUDY (IMS). ITS OBJECTIVES WERE TO ACCUMULATE DATA FOR STUDY OF THE TOPSIDE IONOSPHERE AND TO SURVEY RADIO NOISE AT FOUR FREQUENCIES, FROM BOTH EARTH AND COSMIC SOURCES. IT PREPARED WORLD-WIDE MAPS OF F2 CRITICAL FREQUENCY FROM THE IONOSPHERE SOUNDING DATA. THE ISS-2 WAS A SMALL OBSERVATORY WITH FOUR EXPERIMENTS ON BOARD. THE SPACECRAFT, A RIGHT CYLINDER, 82 CM LONG AND 93.5 CM IN DIAMETER, WAS SPIN STABILIZED AT ABOUT 10 RPM WITH THE SPIN AXIS NORMAL TO THE ECLIPSTIC PLANE. TWO PAIRS OF CROSSED DIPOLE ANTENNAS EXTENDED FROM THE CENTRAL PART OF THE SPACECRAFT AND LAY PERPENDICULAR TO THE SPIN AXIS. THESE ANTENNAE, 36.0 AND 11.4 M LONG, WERE UNFURLED IN ORBIT AND WERE SHARED BY IONOSPHERIC SOUNDING AND RADIO NOISE EXPERIMENTS. A SPHERICAL RETARDING POTENTIAL TRAP SENSOR WAS MOUNTED ON A BOOM PERPENDICULAR TO THE SPIN AXIS. A MAGNETIC ATTITUDE SENSOR WAS MOUNTED ON A SIMILAR BOOM ON THE OPPOSITE SIDE OF THE SPACECRAFT. THE REMAINING EXPERIMENT INVOLVED A BENNETT-TYPE MASS SPECTROMETER WITH TWO SENSORS FLUSH MOUNTED ON OPPOSITE ENDS OF THE SPACECRAFT. SPACECRAFT ATTITUDE WAS DETERMINED BY MEANS OF A MAGNETOMETER, A SOLAR SENSOR, AND AN EARTH HORIZON SENSOR. SMALL TELEMETRY AND COMMAND ANTENNAS EXTENDED FROM THE SPACECRAFT. THE SPACECRAFT WAS POWERED FROM A BATTERY SOLAR-CELL SYSTEM WITH SOLAR CELLS COVERING MOST OF THE CYLINDRICAL SURFACE. ONE RECORDER ON BOARD PERMITTED SPACECRAFT OPERATION IN EITHER A RECORDED (FOR UP TO 112 MIN) OR REAL-TIME MODE. READOUT AND REAL-TIME OPERATION WAS DONE FROM KAGOSHIMA, JAPAN, AND SYOWA STATION, ANTARCTICA.

----- ISS-2, AIKYO -----

INVESTIGATION NAME- SWEEP FREQUENCY TOPSIDE IONOSPHERIC SOUNDER (TOP)

NSSDC ID- 78-016A-01

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES

PERSONNEL

PI - K. AIKYO  
PI - R. MAEDA  
PI - Y. TAKENOSHITA

RADIO RESEARCH LAB  
RADIO RESEARCH LAB  
RADIO RESEARCH LAB

BRIEF DESCRIPTION

THE IONOSPHERE SOUNDING SATELLITE (ISS) IONOSONDE WAS A PULSED RADIO TRANSMITTER AND RECEIVER THAT RECORDED THE TIME DELAY BETWEEN A TRANSMITTED PULSE AND ITS RETURN. FREQUENCIES BETWEEN 0.5 AND 14.8 MHZ WERE SAMPLED IN 0.1-MHZ STEPS TO PROVIDE VIRTUAL RANGE (DELAY TIME) OF SIGNAL REFLECTIONS. MORE THAN ONE VIRTUAL RANGE VS FREQUENCY TRACE WAS OFTEN OBSERVED. THESE RESULTED FROM GROUND REFLECTIONS, PLASMA RESONANCES, HIRERFRINGENCE OF THE IONOSPHERE, NONVERTICAL PROPAGATION, ETC. VIRTUAL RANGE AT A GIVEN FREQUENCY WAS PRIMARILY A FUNCTION OF DISTANCE TRAVESED BY THE SIGNAL, ELECTRON DENSITY ALONG THE PROPAGATION PATH, AND MODE OF PROPAGATION. THE STANDARD DATA FORM, AN IONOGRAM (GRAPH) SHOWING VIRTUAL RANGE AS A FUNCTION OF RADIO PULSE FREQUENCY, WAS USED TO DISPLAY THESE OBSERVATIONS. TWO OTHER FORMS OF DATA WERE PREPARED FROM THESE IONOGRAMS. THEY WERE DIGITAL (FREQUENCY OF VIRTUAL RANGES) VALUES OF CHARACTERISTIC IONOSPHERIC FEATURES READ DIRECTLY FROM THE IONOGRAM AND COMPUTED PROFILES OF ELECTRON DENSITY. THIS SOUNDING MODE OF OPERATION, CALLED TOP-B, REQUIRED 16 S TO SAMPLE ALL FREQUENCIES (ONE IONOGRAM). A TOP-A MODE WAS ALSO AVAILABLE. IN THE TOP-A MODE, AN ITERATIVE LOGIC WAS EMPLOYED WITH THE PULSED TRANSMISSION TO DETERMINE THE F2 REGION CRITICAL FREQUENCY, ITS CORRESPONDING VIRTUAL HEIGHT, AND OTHER RELATED SUPPORTING DATA. WITH DATA FROM THE TOP-A MODE, WORLD-WIDE MAPS OF CRITICAL FREQUENCY WERE PREPARED. FOR BOTH THE TOP-A AND TOP-B MODES, THE COMPLETE CYCLE TIME BETWEEN SUCCESSIVE IONOGRAMS OR SUCCESSIVE CRITICAL FREQUENCY OBSERVATIONS WAS 64 S.

----- ISS-2, IWAMOTO -----

INVESTIGATION NAME- ION MASS SPECTROMETER

NSSDC ID- 78-016A-04

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PARTICLES AND FIELDS

PERSONNEL

PI - I. IWAMOTO

RADIO RESEARCH LAB

BRIEF DESCRIPTION

THIS EXPERIMENT WAS FLOWN TO MEASURE THE POSITIVE ION COMPOSITION OVER THE SPACECRAFT ORBIT. TWO BENNETT-TYPE ION MASS SPECTROMETERS WERE FLUSH MOUNTED ON OPPOSITE ENDS OF THE SPACECRAFT TO LOOK IN OPPOSITE DIRECTIONS ALONG THE SPIN AXIS. THE INSIDE DIAMETER OF THESE CYLINDRICAL SENSORS WAS 36 MM. THE MASS RANGE COVERED WAS 1 TO 20 U, AND THE ION CONCENTRATIONS WERE MEASURED OVER THE RANGE FROM 1 TO 1.16 IONS PER CU CM.

ORIGINAL PAGE IS  
OF POOR QUALITY

----- ISS-2, KOTAKI -----

INVESTIGATION NAME- RADIO NOISE NEAR 2.5, 5, 10, AND 25 MHZ

NSSDC ID- 78-016A-02

INVESTIGATIVE PROGRAM

SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - M. KOTAKI

RADIO RESEARCH LAB

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS EXPERIMENT WERE TO OBSERVE AND STUDY (1) THE GLOBAL DISTRIBUTION OF SPHERICS AND (2) THE TIME VARIATION OF SPHERICS AND COSMIC NOISE. RADIO NOISE IN THE FREQUENCY CHANNELS 2.497, 4.997, 9.997, 10.003, 24.996, AND 25.006 MHZ WERE OBSERVED. CHARACTERISTICS TO BE OBSERVED AT EACH FREQUENCY WERE NOISE INTENSITY (RESOLUTION OF 1/12.8 S) AND OCCURRENCE FREQUENCY OF IMPULSIVE NOISE (6.7% IN DB ABOVE RESOLVED INTENSITY).

----- ISS-2, OGAWA -----

INVESTIGATION NAME- RETARDING POTENTIAL TRAP

NSSDC ID- 78-016A-03

INVESTIGATIVE PROGRAM

SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PARTICLES AND FIELDS

PERSONNEL

PI - T. OGAWA

KYOTO U

BRIEF DESCRIPTION

THIS PROBE WAS A SPHERICAL RETARDING POTENTIAL TRAP DESIGNED TO OBSERVE AMBIENT ION AND ELECTRON DENSITIES RANGING FROM 10.03 TO 10.16 PER CU CM. AMBIENT ION AND ELECTRON TEMPERATURES IN THE RANGE 500 TO 5000 DEG K WERE DETERMINED. AS WITH ALL RETARDING POTENTIAL INSTRUMENTS, THESE PARAMETERS ARE DERIVED FROM INTERPRETATION OF THE CURRENT FLOW MEASUREMENT WITH A GIVEN VOLTAGE SEQUENCE APPLIED TO THE COLLECTOR AND SCREEN GRIDS. THE SENSOR WAS MOUNTED ON A BOOM EXTENDING PERPENDICULAR TO THE SPACECRAFT SPIN AXIS. IT CONSISTED OF A 2 CM DIAMETER COLLECTOR, CONCENTRICALLY ENVELOPED BY 6- AND 10-CM DIAMETER SPHERICAL WIRE GRIDS. THE CURRENT VOLTAGE ANALOG DATA WERE TELEPESTERED AND SUBSEQUENTLY ANALYZED BY THE EXPERIMENTER.

----- IUE -----

SPACECRAFT COMMON NAME- IUE  
ALTERNATE NAMES- INT ULTRAVIOLET EXPL, SAS-D  
10637

NSSDC ID- 78-012A

LAUNCH DATE- 01/26/78  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES NASA-OSS  
INTERNATIONAL ESA  
UNITED KINGDOM SRC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOSTATIONARY  
ORBIT PERIOD- 1035.7 MIN  
PERIAPSIS- 25669. KM ALT

EPOCH DATE- 01/27/78  
INCLINATION- 28.6 DEG  
APOAPSIS- 45887. KM ALT

PERSONNEL

MG - H.J. AUGERMANNE  
SC - E.J. WEILER  
PP - J.P. CORRIGAN  
PS - E.J. WEILER

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE INTERNATIONAL ULTRAVIOLET EXPLORER (IUE, FORMERLY SAS-D) SATELLITE WAS A SPACEBORNE ULTRAVIOLET ASTRONOMICAL OBSERVATORY FOR USE AS AN INTERNATIONAL FACILITY. THE IUE CONTAINED A 45-CM TELESCOPE SOLELY FOR SPECTROSCOPY IN THE WAVELENGTH RANGE OF 110 TO 330 NM. THE SATELLITE AND OPTICAL INSTRUMENTATION WERE PROVIDED BY THE GODDARD SPACE FLIGHT CENTER (GSFC). THE TELEVISION CAMERAS USED AS DETECTORS WERE PROVIDED BY THE UNITED KINGDOM SCIENCE RESEARCH COUNCIL (UKSRC). THE EUROPEAN SPACE AGENCY (ESA, FORMERLY ERSO) SUPPLIED SOLAR PANELS FOR THE SATELLITE AND A EUROPEAN CONTROL CENTER. AFTER LAUNCH, TWO-THIRDS OF THE OBSERVING TIME WAS DIRECTED FROM A CONTROL CENTER AT GSFC, AND ONE-THIRD OF THE TIME THE SATELLITE WAS OPERATED FROM THE EUROPEAN CONTROL CENTER NEAR MADRID. THE IUE OBSERVATORY WAS IN A SYNCHRONOUS ORBIT. THE 45-CM RITCHIE-CHRETIAN F/15 TELESCOPE FEED A SPECTROGRAPH PACKAGE. THE SPECTROGRAPH PACKAGE, USING SEC VIDICON CAMERAS AS DETECTORS, COVERED THE SPECTRAL RANGE FROM 110 TO 330 NM. IT OPERATED IN EITHER A HIGH- OR LOW-RESOLUTION MODE, WITH RESOLUTIONS OF APPROXIMATELY .02 AND .6 NM, RESPECTIVELY. THE SEC VIDICONS COULD INTEGRATE THE SIGNAL FOR UP TO MANY HOURS. THIS INTEGRATION TIME LIMITED DETECTION IN THE HIGH- AND LOW-RESOLUTION MODES TO

APPROXIMATELY 80 AND 0.3 PHOTONS/(80 CM<sup>2</sup> NM), RESPECTIVELY, FOR A SIGNAL-TO-NOISE RATIO OF 80. LISTINGS OF GUEST OBSERVERS AND THEIR INVESTIGATIONS CAN BE OBTAINED FROM THE IUE NEWSLETTER, IUE OBSERVATORY, CODE 605, GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND, 20771 U.S.A.

----- IUE, GUEST INVESTIGATORS -----

INVESTIGATION NAME - LOW/HIGH-RESOLUTION, ULTRAVIOLET SPECTROGRAPH PACKAGE

NSSDC ID - 78-012A-01

INVESTIGATIVE PROGRAM  
CODE SC/ED-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - GUEST INVESTIGATORS

SEE EXPER. DESCRIPT.

BRIEF DESCRIPTION

THIS EXPERIMENT INCLUDED THE ULTRAVIOLET SPECTROGRAPH PACKAGE CARRIED BY THE IUE, CONSISTING OF TWO PHYSICALLY DISTINCT ECHELLE-SPECTROGRAPH/CAMERA UNITS CAPABLE OF ASTRONOMICAL OBSERVATIONS. EACH SPECTROGRAPH HAS A THREE-ELEMENT ECHELLE SYSTEM, COMPOSED OF AN OFF-AXIS PARABOLOIDAL COLLIMATOR, AN ECHELLE GRATING, AND A SPHERICAL FIRST-ORDER GRATING THAT WAS USED TO SEPARATE THE ECHELLE ORDERS AND FOCUS THE SPECTRAL DISPLAY ON AN IMAGE CONVERTER-PLUS-SEC VIDICON CAMERA. FOR EACH UNIT THERE WAS A SPARE CAMERA. THE CAMERA UNITS WERE ABLE TO INTEGRATE THE SIGNAL. THE REBOOT/PREPARED CYCLE FOR THE CAMERAS TOOK APPROXIMATELY 20 MIN. WAVELENGTH CALIBRATION WAS PROVIDED BY THE USE OF A HOLLOW CATHODE COMPARISON LAMP. THE PHOTOMETRIC CALIBRATION WAS ACCOMPLISHED BY OBSERVING STANDARD STARS WHOSE SPECTRAL FLUXES HAD BEEN PREVIOUSLY CALIBRATED BY OTHER MEANS. BOTH ECHELLE-SPECTROGRAPH/CAMERA UNITS WERE CAPABLE OF HIGH-RESOLUTION (0.2 Å) OR LOW-RESOLUTION (6 Å) PERFORMANCE. THE DUAL HIGH/LOW RESOLUTION CAPABILITY WAS IMPLEMENTED BY THE INSERTION OF A FLAT MIRROR IN FRONT OF THE ECHELLE GRATING, SO THAT THE ONLY DISPERSION WAS PROVIDED BY THE SPHERICAL GRATING. AS THE SEC VIDICON COULD INTEGRATE THE SIGNAL FOR UP TO MANY HOURS, DATA WITH A SIGNAL-TO-NOISE RATIO OF 80 COULD BE OBTAINED FOR A 80 STAR OF THE 9TH AND 10TH MAGNITUDE IN THE HIGH- AND LOW-RESOLUTION MODES, RESPECTIVELY. THE DISTINGUISHING CHARACTERISTICS OF THE UNITS WERE THEIR WAVELENGTH COVERAGE. ONE UNIT COVERED THE WAVELENGTH RANGE FROM 119.2 TO 192.4 NM IN THE HIGH-RESOLUTION MODE, AND 113.5 TO 280.5 NM IN THE LOW-RESOLUTION MODE. FOR THE OTHER UNIT, THE RANGES WERE FROM 187.3 TO 383.1 NM AND 180 TO 329.5 NM FOR THE HIGH- AND LOW-RESOLUTION MODES, RESPECTIVELY. EACH UNIT ALSO HAD ITS OWN CHOICE OF ENTRANCE APERTURES EITHER FOR A 3-ARC S HOLE OR A 10° BY 20-ARC S SLOT. THE 10° BY 20-ARC S SLOTS COULD BE BLOCKED BY A COMMON SHUTTER, BUT THE 3-ARC S APERTURE WAS ALWAYS OPEN. AS A RESULT, TWO APERTURE CONFIGURATIONS WERE POSSIBLE - (1) BOTH 3-ARC S APERTURES OPEN AND BOTH 10° BY 20-ARC S SLOTS CLOSED, OR (2) ALL FOUR APERTURES OPEN. WITH THIS INSTRUMENTATION, THE OBSERVATIONAL OPTIONS OPEN TO AN OBSERVER WERE LONG-WAVELENGTH AND/OR SHORT-WAVELENGTH SPECTROGRAPH, HIGH OR LOW RESOLUTION, AND LARGE OR SMALL APERTURES. EXPOSURES COULD BE MADE WITH THE TWO SPECTROGRAPHS SIMULTANEOUSLY, BUT RECOMMENDING THAT THE ENTRANCE APERTURES FOR EACH WERE DISTINCT AND SEPARATED IN THE SKY BY ABOUT 1 ARC MIN. AN ADDITIONAL RESTRICTION WAS THAT DATA COULD BE READ OUT FROM ONLY ONE CAMERA AT A TIME. HOWEVER, ONE CAMERA COULD BE EXPOSING WHILE THE OTHER CAMERA WAS BEING READ OUT. THE CHOICE OF HIGH OR LOW RESOLUTION COULD BE MADE INDEPENDENTLY FOR THE TWO SPECTROGRAPHS SO THAT THE OPERATIONAL MODES OF THE UNITS NEED NOT HAVE BEEN THE SAME. LISTINGS OF GUEST OBSERVERS AND THEIR INVESTIGATIONS CAN BE OBTAINED FROM THE IUE NEWSLETTER, IUE OBSERVATORY, CODE 605, GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND, 20771 U.S.A.

----- IUE, NONE ASSIGNED -----

INVESTIGATION NAME - PARTICLE FLUX MONITOR (SPACECRAFT)

NSSDC ID - 78-012A-02

INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - NONE ASSIGNED

BRIEF DESCRIPTION

THE PARTICLE FLUX MONITOR EXPERIMENT WAS PLACED IN IUE TO MONITOR THE TRAPPED ELECTRON FLUXES THAT AFFECTED THE SENSITIVITY OF THE ULTRAVIOLET SENSOR IN THE IUE SPECTROGRAPH PACKAGE EXPERIMENT, NSSDC ID 78-012A-01. THE PARTICLE FLUX MONITOR WAS A LITHIUM-DRIFTED SILICON DETECTOR WITH A HALF-ANGLE CONICAL FIELD OF VIEW OF 16 DEG. IT HAD AN ALUMINUM ABSORBER OF 0.357 G/80 CM IN FRONT OF THE COLLIMATOR AND A BRASS SHIELDING HAVING A MINIMUM THICKNESS OF 2.31 6/80 CM. THE EFFECTIVE ENERGY THRESHOLD FOR ELECTRON MEASUREMENTS WAS 1.5 MEV. THE EXPERIMENT WAS ALSO SENSITIVE TO PROTONS WITH ENERGIES GREATER THAN 10 MEV. DATA CAN BE PROVIDED TO INTERESTED PERSONS IN THE FORM OF DAILY STRIP CHARTS BY THE IUEOCC. THE INSTRUMENT WAS USED AS AN OPERATIONAL TOOL TO AID IN DETERMINING BACKGROUND RADIATION AND ACCEPTABLE CAMERA EXPOSURE TIME. IT WAS PROVIDED BY DR. C. BOSTROM OF THE APPLIED PHYSICS LABORATORY.

----- JIKIEN -----

SPACECRAFT COMMON NAME - JIKIEN  
ALTERNATE NAME - EXOSPHERIC SAT. B, EROS-B  
11027

NSSDC ID - 78-087A

LAUNCH DATE - 09/16/78  
LAUNCH SITE - KAGOSHIMA, JAPAN  
LAUNCH VEHICLE - H-3H

WEIGHT - 92.4 KG

SPONSORING COUNTRY/AGENCY  
JAPAN ISAS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE - GEOCENTRIC  
ORBIT PERIOD - 95.5 MIN  
PERIAPSIS - 230. KM ALT  
EPOCH DATE - 09/16/78  
INCLINATION - 31. DEG  
APOAPSIS - 30556. KM ALT

PERSONNEL  
PI - T. OBAYASHI  
PS - N. KAWASHIMA  
PS - H. OTA  
PS - A. NISHIDA

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BRIEF DESCRIPTION

THIS MISSION WAS PART OF THE JAPANESE CONTRIBUTION TO THE INTERNATIONAL MAGNETOSPHERIC STUDY AND CARRIED OUT COORDINATED OBSERVATIONS WITH KYKKO. INVESTIGATIONS OF CORRELATED MECHANISMS BETWEEN PARTICLES AND FIELDS AND PLASMA TURBULENCE WERE MADE BY MAKING OBSERVATIONS OF THE DETAILED STRUCTURE OF THE PLASMAPAUSE WITH IN SITU MEASUREMENT TECHNIQUES USING PLASMA WAVE PHENOMENA AND ELECTROSTATIC PARTICLE ANALYZERS. THE SPACECRAFT, A 12-SIDED POLYGON, CARRIED DIPOLE EXTENDABLE ANTENNAS WITH LENGTHS OF 103 M AND 49.6 M AND A 3-P POLE FOR A VECTOR MAGNETOMETER. A SOLAR PANEL ARRAY PROVIDED 50 W INTO A BATTERY AND REGULATOR SYSTEM. THE SPACECRAFT SPIN STABILIZED AT 150 RPM, DROPPING TO 5 RPM WHEN THE TWO SETS OF ANTENNAS WERE EXTENDED. ATTITUDE WAS MEASURED WITH A SUN SENSOR TO AN ACCURACY OF 0.5 DEG. A 0.5-W 136-MHz PCM/PW TELEMETRY SYSTEM HANDLED 256 OR 1024 BPS AND A 2-W 400-MHz PW SYSTEM HANDLED WIDEBAND 10-KHZ OR 3-KHZ DATA. DATA ACQUISITION WAS REAL TIME EXCEPT FOR A 10K-BYTE MEMORY FOR HOUSEKEEPING AND PLASMA PARAMETER DATA.

----- JIKIEN, EJIRI -----

INVESTIGATION NAME - IMPEDANCE AND ELECTRIC FIELD (EJIRI)

NSSDC ID - 78-087A-04

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES AND RAYO PHYSICS

PERSONNEL  
PI - R. EJIRI  
OI - A. NISHIDA  
CI - Y. WATANABE  
OI - T. OGAWA

U OF TOKYO  
U OF TOKYO  
U OF TOKYO  
KYOTO U

BRIEF DESCRIPTION

A SWEEP FREQUENCY IMPEDANCE PROBE MEASURED FROM .07 TO 2 MHZ USING A 103-M (TIP-TO-TIP) ANTENNA. THIS PROVIDED BASIC DATA FOR CALIBRATION OF NATURAL PLASMA WAVE DETECTIONS AND DATA FOR THE ESTIMATION OF THE TRANSMISSION EFFICIENCY FOR PLASMA WAVE STIMULATIONS. ELECTRON DENSITY WAS MEASURED INDEPENDENTLY OF ALL OTHER TECHNIQUES AND MEASURED ACCURATELY BY CANCELING STRAY CAPACITANCE. USING THIS SAME ANTENNA, ELECTRIC FIELDS FROM DC TO 3 MHZ WERE MEASURED. THE SPACECRAFT BODY WAS COATED WITH CONDUCTIVE MATERIALS TO AVOID THE GENERATION OF LOCAL ELECTRIC FIELDS SO ACCURATE MEASUREMENTS OF NATURAL FIELDS COULD BE MADE.

----- JIKIEN, KAWASHIMA -----

INVESTIGATION NAME - CONTROLLED ELECTRON BEAM EMISSIONS (KEBE)

NSSDC ID - 78-087A-07

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL  
PI - N. KAWASHIMA  
OI - S. MURASATO

U OF TOKYO  
U OF TOKYO

BRIEF DESCRIPTION

THIS EXPERIMENT PROVIDED IMPORTANT EFFECTS FOR THE ANALYSES OF WAVE/PARTICLE INTERACTIONS. SPACECRAFT POTENTIAL WAS CONTROLLED BY THE EMISSION OF ELECTRON BEAMS THAT COULD BE VARIED IN ENERGY FROM 100 TO 200 EV IN STEPS TO ALLOW OTHER INSTRUMENTS TO MAKE ACCURATE MEASUREMENTS OF LOW ENERGY IONS AND ELECTRONS. THE BEAMS COULD ALSO CAUSE PLASMA INSTABILITIES THAT RESULTED IN THE PRODUCTION OF MANY KINDS OF PLASMA WAVES. BEAM CURRENTS OF 0.25, 0.5, 0.75, AND 1.0 MA COULD BE SELECTED FOR ANY ENERGY OR AN AUTOMATIC MODE COULD BE SELECTED WHERE ENERGY AND BEAM CURRENT WERE CHANGED EVERY 4 OR 32 S.



**BRIEF DESCRIPTION**

THE INSTRUMENT WAS A TV CAMERA THAT CONSISTED OF AN IMAGE-MEMORY TUBE WITH A SLOW-SCAN READOUT. THE PHOTOELECTRIC SURFACE WAS POTASSIUM BROMIDE WITH A MAGNESIUM FLUORIDE FACEPLATE THAT MADE IT SENSITIVE TO PHOTONS AROUND 1300 Å. A PAIR OF SPHERICAL MIRRORS PRODUCED AN IMAGE ON THE PHOTOELECTRIC SURFACE. AN AURORAL PATTERN WAS MEASURED EVERY 120 S WHEN THE SATELLITE WAS OVER THE ARCTIC. THE NUMBER OF PIXELS IN AN IMAGE FRAME WAS 178 X 198 AND THE CAMERA FIELD OF VIEW WAS 60 DEG.

----- KYOKKO, MUKAI -----

INVESTIGATION NAME- ELECTRON ENERGY ANALYZER

NSSDC ID- 78-014A-02

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY**PERSONNEL**

PI - T. MUKAI

U OF TOKYO

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTED OF TWO SPHERICAL ELECTROSTATIC ANALYZERS, ONE MOUNTED AT THE FRONT AND ONE AT THE BACK OF THE SPACECRAFT TO VIEW THE ELECTRONS STREAMING EITHER DOWN THE MAGNETIC FIELD LINE OR TOWARD THE EQUATOR. EACH ANALYZER COVERED THE ENERGY RANGE FROM 4.5 EV TO 21.3 KEV IN NINE SPECTRAL BANDS.

----- KYOKKO, NAKAMURA -----

INVESTIGATION NAME- UV GLOW SPECTROPHOTOMETER

NSSDC ID- 78-014A-05

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITEINVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES**PERSONNEL**PI - M. NAKAMURA  
OI - T. WATANABETSUKUBA U  
TSUKUBA U**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTED OF A GRATING SPECTROGRAPH WITH A RESOLUTION OF 10 Å AND VIBRATING SLIT. THE SPECTRUM WAS SCANNED IN A WIDTH OF PLUS OR MINUS 25 Å AROUND THE FOLLOWING SPECTRAL LINES: 304 Å (HE PLUS), 584 Å (HE), 833 Å (O PLUS), 1216 Å (H, LYMAN-ALPHA) AND 1304 Å (O). FIVE CHANNEL MULTIPLIERS, ONE FOR EACH SPECTRAL LINE, WERE USED TO MEASURE INTENSITY. THE UV GLOW FROM THE ATMOSPHERE, MAGNETOSPHERE, AND INTERPLANETARY SPACE WAS OBSERVED.

----- KYOKKO, OYAMA -----

INVESTIGATION NAME- ELECTRON PROBES

NSSDC ID- 78-014A-01

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITEINVESTIGATION DISCIPLINE(S)  
IONOSPHERES**PERSONNEL**PI - K. OYAMA  
OI - K. HIRAOU OF TOKYO  
U OF TOKYO**BRIEF DESCRIPTION**

THE EXPERIMENT WAS COMPRISED OF SEVERAL INSTRUMENTS DESIGNED TO MEASURE ELECTRON TEMPERATURE AND DENSITY AS WELL AS IONIC COMPOSITION. THE ELECTRON TEMPERATURE PROBE WAS AN RF-RECTIFIER TYPE, AND A LANGMUIR PROBE WAS USED TO OBTAIN ELECTRON DENSITY.

----- KYOKKO, YOSHINO -----

INVESTIGATION NAME- ELECTROSTATIC PLASMA WAVE MEASUREMENT

NSSDC ID- 78-014A-04

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITEINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS**PERSONNEL**PI - T. YOSHINO  
OI - R. NAKAMURA  
OI - T. ITOHU OF ELECTRO-COMMUN  
U OF TOKYO  
U OF TOKYO**BRIEF DESCRIPTION**

THIS INVESTIGATION INVOLVED ELECTROSTATIC WAVES IN THE MAGNETOSPHERE IN THE FREQUENCY RANGE 0.4 TO 30 kHz AND RADIO WAVES BETWEEN 0.045 AND 3 MHz. TWO FARADAY CUPS WERE EMPLOYED TO PICK UP ELECTROSTATIC WAVES, WHILE A DIPOLE ANTENNA WAS USED TO RECEIVE RADIO WAVES. THE DIPOLE ANTENNA CONSISTED OF A PAIR OF THIN WIRES 1.9 M LONG AND WAS ATTACHED ALONG THE EXTENDABLE STABILIZATION BOOMS. ONE FARADAY CUP WAS MOUNTED TO LOOK PARALLEL TO THE SPIN AXIS AND THE OTHER PERPENDICULAR TO THE SPIN AXIS. WAVES IN THE 0.4 TO 30 kHz RANGE WERE RECEIVED BY

WIDEBAND RECEIVERS AND TELEMETERED IN ANALOG FORM. THE WAVE STRENGTH IN THE 0.045 TO 3 MHz RANGE WAS MEASURED IN 11 BANDS.

\*\*\*\*\* LANDSAT 2 \*\*\*\*\*

SPACECRAFT COMMON NAME- LANDSAT 2  
ALTERNATE NAMES- EARTH RES TECH SAT.-B, PL-733D  
ERTS-B, 07615

NSSDC ID- 75-004A

LAUNCH DATE- 01/22/75  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTASPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFCINITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 103.28 MIN  
PERIAPSIS- 907. KM ALT  
APUAPSIS- 918. KM ALT  
EPOCH DATE- 01/25/75  
INCLINATION- 99.05 DEG  
APUAPSIS- 918. KM ALT

PERSONNEL  
MG - B.T. NOLAN  
SC - R.I. WHITMAN  
PM - C.M. MACKENZIE  
PS - S.C. FREDEN

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

**BRIEF DESCRIPTION**  
LANDSAT 2 WAS THE SECOND OF A SERIES OF MODIFIED NIMBUS SATELLITES. THE NEAR-POLAR ORBITING SPACECRAFT SERVED AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR OBTAINING INFORMATION ON AGRICULTURAL AND FORESTRY RESOURCES, GEOLOGY AND MINERAL RESOURCES, HYDROLOGY AND WATER RESOURCES, GEOGRAPHY, CARTOGRAPHY, ENVIRONMENTAL POLLUTION, OCEANOGRAPHY AND MARINE RESOURCES, AND METEOROLOGICAL PHENOMENA. TO ACCOMPLISH THESE OBJECTIVES THE SPACECRAFT WAS EQUIPPED WITH (1) A FIVE-CHANNEL MULTISPECTRAL SCANNER (MSS) AND A THREE-CAMERA RETURN BEAM VIDICON (RBV) TO OBTAIN BOTH VISUAL AND IR PHOTOGRAPHIC AND RADIONOMETRIC IMAGES OF THE EARTH; (2) A DATA COLLECTION SYSTEM TO COLLECT INFORMATION FROM REMOTE INDIVIDUALLY EQUIPPED GROUND STATIONS AND TO RELAY THE DATA TO CENTRAL ACQUISITION STATIONS. LANDSAT 2 CARRIED TWO WIDE-BAND VIDEO TAPE RECORDERS (WBVR) CAPABLE OF STORING UP TO 30 MIN OF SCANNER OR CAMERA DATA TO GIVE THE SPACECRAFT'S SENSORS A NEAR-GLOBAL COVERAGE CAPABILITY. AN ADVANCED ATTITUDE CONTROL SYSTEM CONSISTING OF HORIZON SCANNERS, SUN SENSORS, AND A COMMAND ANTENNA COMBINED WITH A FREON GAS PROPULSION SYSTEM PERMITTED THE SPACECRAFT'S ORIENTATION TO BE CONTROLLED TO WITHIN PLUS OR MINUS 0.7 DEG IN ALL THREE AXES. SPACECRAFT COMMUNICATIONS INCLUDED A COMMAND SUBSYSTEM OPERATING AT 154.2 AND 2106.4 MHZ AND A PCM NARROW-BAND TELEMETRY SUBSYSTEM, OPERATING AT 2287.5 AND 137.86 MHZ, FOR SPACECRAFT HOUSEKEEPING, ATTITUDE, AND SENSOR PERFORMANCE DATA. VIDEO DATA FROM THE THREE-CAMERA RBV SYSTEM WAS TRANSMITTED IN BOTH REAL TIME AND FROM WBVR AT 2276.5 MHZ, WHILE INFORMATION FROM THE MSS WAS CONSTRAINED TO A 20-MHZ RF BANDWIDTH AT 2229.5 MHZ.

----- LANDSAT 2, BALLA -----

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 75-004A-02  
INVESTIGATIVE PROGRAM  
CODE ERINVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGYPERSONNEL  
PI - J.A. BALLA

NASA-GSFC

**BRIEF DESCRIPTION**  
THE LANDSAT 2 MULTISPECTRAL SCANNER (MSS) WAS DESIGNED TO PROVIDE REPETITIVE DAY-NIGHT ACQUISITION OF HIGH-RESOLUTION MULTISPECTRAL DATA OF THE EARTH'S SURFACE ON A GLOBAL BASIS. WHILE ITS PRIMARY FUNCTION WAS TO OBTAIN INFORMATION IN VARIOUS AREAS SUCH AS AGRICULTURE, FORESTRY, GEOLOGY, AND HYDROLOGY, THE MSS SYSTEM WAS ALSO USED FOR OCEANOGRAPHIC AND METEOROLOGICAL PURPOSES, I.E., TO MAP SEA-ICE FIELDS, LOCATE AND TRACK MAJOR OCEAN CURRENTS, MONITOR BOTH AIR AND WATER POLLUTION, DETERMINE SNOW COVER, INVESTIGATE SEVERE STORM ENVIRONMENTS, ETC. THE MSS CONSISTED OF A 22.86-CM DOUBLE REFLECTOR-TYPE TELESCOPE, SCANNING MIRROR, FILTERS, DETECTORS, AND ASSOCIATED ELECTRONICS. THE SCANNER OPERATED IN THE FOLLOWING SPECTRAL INTERVALS -- BAND 1 - 0.5 TO 0.6 MICRORAMETERS, BAND 2 - 0.6 TO 0.7 MICRORAMETERS, BAND 3 - 0.7 TO 0.8 MICRORAMETERS, BAND 4 - 0.8 TO 1.1 MICRORAMETERS, AND BAND 5 - 10.4 TO 12.6 MICRORAMETERS. THIS LAST BAND WHICH LIES IN THE THERMAL (EMISSIVE) PART OF THE SPECTRUM, GAVE LANDSAT 2 NIGHTTIME SENSING CAPABILITIES, A FEATURE LACKING IN THE MSS ON LANDSAT 1. INCOMING RADIATION WAS COLLECTED BY THE SCANNING MIRROR, WHICH OSCILLATED 2.89 DEG TO EITHER SIDE OF NADIR AND SCANNED CROSS-TRACK SWATHS 185-KM WIDE. THE ALONG-TRACE SCAN WAS PRODUCED BY THE ORBITAL MOTION OF THE SPACECRAFT. THE PRIMARY IMAGE PRODUCED AT THE IMAGE PLANE WAS RELATED BY USE OF FIBER-OPTIC BUNDLES TO DETECTORS WHERE CONVERSION TO AN ELECTRONIC SIGNAL WAS ACCOMPLISHED. OPTICAL FILTERS WERE USED TO PRODUCE THE DESIRED SPECTRAL SEPARATION. SIX DETECTORS WERE EMPLOYED IN EACH OF THE FIRST FOUR SPECTRAL BANDS AND TWO IN THE FIFTH BAND -- BANDS 1 THROUGH 4 USED PHOTOMULTIPLIER TUBES AS DETECTORS, BAND 5 USED SILICON PHOTODIODES, AND BAND 5 USED

MERCURY-CADMIUM-TELLURIDE DETECTORS. A MULTIPLEXER INCLUDED IN THE MSS SYSTEM PROCESSED THE SCANNER'S 26 CHANNELS OF DATA. THESE DATA WERE TIME-MULTIPLEXED AND THEN CONVERTED TO A PULSE-CODE MODULATED SIGNAL BY AN A/D CONVERTER. THE DATA WERE THEN TRANSMITTED (AT 2229.5 MHZ) DIRECTLY TO AN ACQUISITION STATION OR STORED ON MAGNETIC TAPE FOR SUBSEQUENT PLAYBACK THE NEXT TIME THE SPACECRAFT COMES WITHIN COMMUNICATION RANGE OF AN ACQUISITION STATION. DATA FROM THIS EXPERIMENT ARE HANDLED BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD, AND ARE AVAILABLE TO APPROVED INVESTIGATORS THROUGH ITS LANDSAT USERS SERVICES SECTION. ALL OTHER INTERESTED INDIVIDUALS MAY OBTAIN DATA THROUGH THE EARTH RESOURCES DATA CENTER, DEPARTMENT OF THE INTERIOR, SIOUX FALLS, SD.

\*\*\*\*\* LANDSAT 3 \*\*\*\*\*

SPACECRAFT COMMON NAME- LANDSAT 3  
ALTERNATE NAMES- EARTH RES TECH SAT.-C, ERTS-C  
10702, LANDSAT-C

NSSDC ID- 78-026A

LAUNCH DATE- 03/05/78 WEIGHT- 960. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/06/78  
ORBIT PERIOD- 103.1 MIN INCLINATION- 99.1 DEG  
PERIAPSIS- 897. KM ALT APOAPSIS- 914. KM ALT

PERSONNEL  
MG - B.T. NOLAN NASA HEADQUARTERS  
SC - R.I. WHITMAN NASA HEADQUARTERS  
PM - C.M. MACKENZIE NASA-GSFC  
PS - S.C. FREDEN NASA-GSFC

BRIEF DESCRIPTION  
LANDSAT 3 WAS A MODIFIED VERSION OF THE NIMBUS SATELLITE, WITH THE GENERAL MISSION OBJECTIVES OF EXTENDING THE PERIOD OF SPACE-DATA ACQUISITION FOR EARTH RESOURCES INITIATED BY LANDSAT 1 (FORMERLY ERTS 1) AND CONTINUED BY LANDSAT 2. THE NEAR-POLAR ORBITING SPACECRAFT SERVED AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR OBTAINING INFORMATION ON AGRICULTURAL AND FORESTY RESOURCES, GEOLOGY AND MINERAL RESOURCES, HYDROLOGY AND WATER RESOURCES, GEOGRAPHY, CARTOGRAPHY, ENVIRONMENTAL POLLUTION, OCEANOGRAPHY AND MARINE RESOURCES, AND METEOROLOGICAL PHENOMENA. TO ACCOMPLISH THESE OBJECTIVES, THE SPACECRAFT WAS EQUIPPED WITH (1) A FIVE-CHANNEL MULTISPECTRAL SCANNER (MSS) AND A TWO-CAMERA RETURN BEAM VIDICON (RBV) TO OBTAIN BOTH VISIBLE AND IR PHOTOGRAPHIC AND RADIOMETRIC IMAGES OF THE EARTH, AND (2) A DATA COLLECTION SYSTEM TO COLLECT INFORMATION FROM REMOTE INDIVIDUALLY EQUIPPED GROUND STATIONS AND TO RELAY THE DATA TO CENTRAL ACQUISITION STATIONS. LANDSAT 3 CARRIED TWO WIDE-BAND VIDEO TAPE RECORDERS (WBVR) CAPABLE OF STORING UP TO 30 MIN OF SCANNER OR CAMERA DATA TO GIVE THE SPACECRAFT'S SENSORS A NEAR-GLOBAL COVERAGE CAPABILITY. AN ADVANCED ATTITUDE CONTROL SYSTEM CONSISTING OF HORIZON SCANNERS, SUN SENSORS, AND A COMMAND ANTENNA COMBINED WITH FREON GAS PROPULSION SYSTEM PERMITTED THE SPACECRAFT'S ORIENTATION TO BE CONTROLLED TO WITHIN PLUS OR MINUS 1.0 DEG IN ALL THREE AXES. SPACECRAFT COMMUNICATIONS INCLUDED A COMMAND SUBSYSTEM OPERATING AT 154.2 AND 2106.4 MHZ AND A PCM NARROW-BAND TELEMETRY SUBSYSTEM, OPERATING AT 2287.5 AND 137.86 MHZ, FOR SPACECRAFT HOUSEKEEPING, ATTITUDE, AND SENSOR PERFORMANCE DATA. VIDEO DATA FROM THE TWO-CAMERA RBV SYSTEM WERE TRANSMITTED IN BOTH REAL TIME AND FROM THE WIDE-BAND RECORDER SYSTEM AT 2265.5 MHZ, WHILE INFORMATION FROM THE MSS WAS CONSTRAINED TO A 20-MHZ RF BANDWIDTH AT 2229.5 MHZ.

\*\*\*\*\* LANDSAT 3, BALLA\*\*\*\*\*

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 78-026A-02 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL  
PI - J.A. BALLA NASA-GSFC

BRIEF DESCRIPTION  
THE LANDSAT 3 MULTISPECTRAL SCANNER (MSS) PROVIDED REPETITIVE DAY/NIGHT ACQUISITION OF HIGH-RESOLUTION MULTISPECTRAL DATA OF THE EARTH'S SURFACE ON A GLOBAL BASIS. WHILE ITS PRIMARY FUNCTION WAS TO OBTAIN DATA IN VARIOUS AREAS SUCH AS AGRICULTURE, FORESTRY, GEOLOGY, AND HYDROLOGY, THE MSS SYSTEM WAS ALSO USED FOR OCEANOGRAPHIC AND METEOROLOGICAL PURPOSES, I.E., TO MAP SEA-ICE FIELDS, LOCATE AND TRACK MAJOR OCEAN CURRENTS, MONITOR BOTH AIR AND WATER POLLUTION, DETERMINE SNOW COVER, INVESTIGATE SEVERE STORM ENVIRONMENTS, ETC. THE MSS CONSISTED OF A DOUBLE REFLECTOR-TYPE TELESCOPE, SCANNING MIRROR, FILTERS, DETECTORS, AND ASSOCIATED ELECTRONICS. THE SCANNER OPERATED IN THE FOLLOWING SPECTRAL INTERVALS -- BAND 1 - 0.5 TO 0.6 MICROMETER, BAND 2 - 0.6 TO 0.7 MICROMETER, BAND 3 - 0.7 TO 0.8 MICROMETER, BAND 4 - 0.8 TO 1.1 MICROMETERS, AND BAND 5 - 10.4 TO 12.6 MICROMETERS. THIS LAST BAND, WHICH LAY

IN THE THERMAL (EMISSIVE) PART OF THE SPECTRUM, GAVE LANDSAT 3 NIGHTTIME SENSING CAPABILITIES, A FEATURE LACKING IN THE MSS IN LANDSAT 1. INCOMING RADIATION WAS COLLECTED BY THE SCANNING MIRROR, WHICH OSCILLATED 2.89 SEC TO EITHER SIDE OF NADIR AND SCANNED CROSS-TRACK SWATHS 185-KM WIDE. THE ALONG-TRACK SCAN WAS PRODUCED BY THE ORBITAL MOTION OF THE SPACECRAFT. THE PRIMARY IMAGE PRODUCED AT THE IMAGE PLANE WAS RELAYED BY USE OF FIBER-OPTIC BUNDLES TO DETECTORS WHERE CONVERSION TO AN ELECTRONIC SIGNAL WAS ACCOMPLISHED. OPTICAL FILTERS WERE USED TO PRODUCE THE DESIRED SPECTRAL SEPARATION. SIL DETECTORS WERE EMPLOYED IN EACH OF THE FIRST FOUR SPECTRAL BANDS AND TWO IN THE FIFTH BAND -- BANDS 1 THROUGH 3 USED PHOTOMULTIPLIER TUBES AS DETECTORS, BAND 4 USED SILICON PHOTODIODES, AND BAND 5 USED MERCURY-CADMIUM-TELLURIDE DETECTORS. THE MINIMUM DIMENSIONS THAT WERE RESOLVED BY THE MSS WERE 80 M FOR BANDS 1 THROUGH 4 AND 240 M FOR BAND 5. A MULTIPLEXER INCLUDED IN THE MSS SYSTEM PROCESSED THE SCANNER'S 26 CHANNELS OF DATA. THESE DATA WERE TIME-MULTIPLEXED AND THEN CONVERTED TO A PCM SIGNAL BY AN A/D CONVERTER. THE DATA WERE TRANSMITTED (AT 2229.5 MHZ) DIRECTLY TO AN ACQUISITION STATION OR STORED ON MAGNETIC TAPE FOR SUBSEQUENT PLAYBACK. THE NEXT TIME THE SPACECRAFT CAME WITHIN COMMUNICATION RANGE OF AN ACQUISITION STATION, DATA FROM THIS EXPERIMENT ARE HANDLED BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD, AND ARE MADE AVAILABLE TO APPROVED INVESTIGATORS THROUGH ITS LANDSAT USERS SERVICES. ALL OTHER INTERESTED INDIVIDUALS ARE TO OBTAIN DATA THROUGH THE EARTH RESOURCES DATA CENTER, DEPARTMENT OF THE INTERIOR, SIOUX FALLS, SD.

----- LANDSAT 3, GILBERT-----

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-026A-03 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
COMMUNICATIONS  
EARTH RESOURCES SURVEY

PERSONNEL  
PI - E.L. GILBERT NASA-GSFC

BRIEF DESCRIPTION  
THE LANDSAT 3 DATA COLLECTION SYSTEM (DCS) PROVIDED USERS WITH NEAR REAL-TIME DATA COLLECTED FROM VARIOUS REMOTE LOCATIONS. THE DCS WAS COMPOSED OF: (1) THE DATA COLLECTION PLATFORMS (DCP'S) WHICH MIGHT HAVE BEEN OCEAN BUOYS, CONSTANT PRESSURE BALLOONS, OR AUTOMATIC GROUND STATIONS, (2) THE SATELLITE EQUIPMENT, AND (3) THE GROUND DATA CENTERS INCLUDING REMOTE RECEIVING SITES AND THE GROUND DATA HANDLING SYSTEM AT GSFC. USE OF THE LANDSAT SPACEBORNE DCS PROVIDED A CONTINUAL FLOW OF INFORMATION FOR BETTER MANAGEMENT OF WILDLIFE, MARINE, AGRICULTURE, WATER, AND FORESTY RESOURCES AND LED TO IMPROVED WEATHER FORECASTS, POLLUTION CONTROL, AND EARTHQUAKE PREDICTION AND WARNING. THE ENVIRONMENTAL SENSORS MOUNTED ON A DCP WERE SELECTED BY INDIVIDUAL INVESTIGATORS TO SATISFY THEIR PARTICULAR REQUIREMENTS. FROM A PLANNED ORBIT OF 912 KM, THE SPACECRAFT WAS CAPABLE OF ACQUIRING DATA FROM DCP'S WITHIN A RADIUS OF APPROXIMATELY 3100 KM FROM THE SUBSATELLITE POINT, THUS ALLOWING DATA TO BE OBTAINED FROM ANY REMOTE PLATFORM AT LEAST ONCE EVERY 12 H. THE DCP'S TRANSMIT AT 401.55 MHZ. THE DCS EQUIPMENT, ESSENTIALLY A RECEIVER, RECEIVED AND RETRANSMITED DATA (AT 2287.5 MHZ) TO SELECTED GROUND RECEIVING STATIONS. THERE WAS NO SIGNAL MULTIPLEXING OR DATA PROCESSING ON THE SATELLITE. THE LANDSAT 3 DCS ACCOMMODATED UP TO 1000 DCP'S DEPLOYED THROUGHOUT THE CONTINENTAL US. DATA FROM THIS EXPERIMENT WERE HANDLED AND DISTRIBUTED TO THE VARIOUS PLATFORM INVESTIGATORS BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD.

----- LANDSAT 3, WILSON-----

INVESTIGATION NAME- RETURN BEAM VIDICON CAMERA (RBV)

NSSDC ID- 78-026A-01 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL  
PI - L. WILSON NASA-GSFC

BRIEF DESCRIPTION

THE LANDSAT 3 RETURN BEAM VIDICON (RBV) CAMERA SYSTEM CONTAINED TWO IDENTICAL CAMERAS COVERING THE SPECTRAL BAND FROM 0.55 TO 0.75 MICROMETER. THE TWO EARTH-ORIENTED CAMERAS WERE MOUNTED TO A COMMON BASE, STRUCTURALLY ISOLATED FROM THE SPACECRAFT TO MAINTAIN ACCURATE ALIGNMENT. EACH CAMERA CONTAINED AN OPTICAL LENS, A RBV SENSOR, A THERMOELECTRIC COOLER, DEFLECTION AND FOCUS COILS, A MECHANICAL SHUTTER, ERASE LAMPS, AND SENSOR ELECTRONICS. THE CAMERAS WERE ALIGNED TO VIEW ADJACENT 84-KM SQUARE GROUND SCENES WHICH OVERLAPPED SLIGHTLY SO THAT THE TOTAL WIDTH OF THE GROUND SCENE WAS 185 KM. THE CAMERAS WERE OPERATED EVERY 12.5 S TO PRODUCE OVERLAPPING IMAGES ALONG THE DIRECTION OF SPACECRAFT MOTION. AFTER SHUTTERING, THE IMAGE WAS SCANNED BY AN ELECTRON BEAM TO PRODUCE A VIDEO OUTPUT SIGNAL. THE TIMING CYCLE WAS ARRANGED SO THAT A 3.5-S OFFSET WAS INTRODUCED BETWEEN THE READOUTS OF THE TWO CAMERAS, PERMITTING SEQUENTIAL READOUT OF THE CAMERAS, ALLOWING THE SAME TAPE RECORDER AND COMMUNICATIONS CHANNEL TO BE USED. VIDEO DATA FROM THE RBV WERE TRANSMITTED (AT 2265.5

ORIGINAL PAGE IS  
OF POOR QUALITY

MHz) IN BOTH REAL-TIME AND TAPE-RECORDER MODES. FROM A NOMINAL SPACECRAFT ALTITUDE OF 912 KM, THE RSV HAD A GROUND RESOLUTION OF 40 M (TWICE THE LANDSAT 1 RESOLUTION OF 80 M). DATA FROM THIS EXPERIMENT ARE HANDLED BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD, AND ARE MADE AVAILABLE TO APPROVED INVESTIGATORS AND AGENCIES THROUGH ITS LANDSAT USERS SERVICES SECTION. ALL OTHER INTERESTED INDIVIDUALS CAN OBTAIN DATA THROUGH THE EARTH RESOURCES DATA CENTER, DEPARTMENT OF THE INTERIOR, SIOUX FALLS, SD.

\*\*\*\*\* MAGION\*\*\*\*\*

SPACECRAFT COMMON NAME- MAGION  
ALTERNATE NAMES- 11110

NSSDC ID- 78-099C

LAUNCH DATE- 10/24/78  
LAUNCH SITE- PLESetsk, U.S.S.R.  
LAUNCH VEHICLE- UNKNOWN

WEIGHT- 15. KG

SPONSORING COUNTRY/AGENCY  
U.S.S.R. INTERCOS  
CZECHOSLOVAKIA CAS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/25/78  
ORBIT PERIOD- 96.4 MIN INCLINATION- 82.9 DEG  
PERIAPSIS- 407. KM ALT APOAPSIS- 768. KM ALT

PERSONNEL  
PS - P. TRISKA GEOPHYS INST CAS

BRIEF DESCRIPTION  
MAGION WAS A CZECHOSLOVAKIAN SUBSATELLITE THAT SEPARATED FROM INTERCOSMOS 18 ON NOV. 14, 1978. IT WAS DESIGNED TO CARRY IONOSPHERIC-TYPE EXPERIMENTS RELATED TO THE INTERNATIONAL MAGNETOSPHERIC STUDY (IMS). MAGION HAD A PRISM SHAPE (.3 X .3 X .15 M) AND FOLLOWED THE ORBIT OF INTERCOSMOS 18. CZECHOSLOVAK PARTICIPATION IN STUDIES OF MUTUAL RELATIONS BETWEEN THE EARTH'S MAGNETOSPHERE AND IONOSPHERE CONSISTED MAINLY IN MEASURING OF THE ULF PHENOMENA ON BOARD OF THE CZECHOSLOVAK-MADE MAGION MOVING SLOWLY AWAY FROM INTERCOSMOS 18 AND IN COOPERATION ON MEASUREMENTS OF PLASMA PROPERTIES IN THE VICINITY OF THIS SATELLITE. THE ION COMPOSITION ESTIMATED WITH THE AID OF A BENNET MASS-SPECTROMETER AND THE ELECTRON TEMPERATURE TAKEN WITH THE USE OF A RADIOFREQUENCY PLANE PROBE HAVE BEEN RECORDED. INFORMATION ON THE EXPERIMENTS HAS BEEN REQUESTED FROM TRISKA (6/79) BUT NOT YET RECEIVED.

\*\*\*\*\* MAGSAT\*\*\*\*\*

SPACECRAFT COMMON NAME- MAGSAT  
ALTERNATE NAMES- AER-C, GLOBAL MAGNETIC SURV MSN  
MAGSAT-A, 11604

NSSDC ID- 79-094A

LAUNCH DATE- 10/30/79  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- SCOUT

WEIGHT- 158. KG

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/31/79  
ORBIT PERIOD- 93.9 MIN INCLINATION- 96.8 DEG  
PERIAPSIS- 351.9 KM ALT APOAPSIS- 578.4 KM ALT

PERSONNEL  
MG - J.P. MURPHY NASA HEADQUARTERS  
SC - J.V. TARANIK NASA HEADQUARTERS  
PM - G.W. DUSLEY NASA-GSFC  
PS - R.A. LANGE NASA-GSFC

BRIEF DESCRIPTION  
THE MAGSAT PROJECT WAS A JOINT NASA/UNITED STATES GEOLOGICAL SURVEY (USGS) EFFORT TO MEASURE NEAR-EARTH MAGNETIC FIELDS ON A GLOBAL BASIS. OBJECTIVES INCLUDED OBTAINING AN ACCURATE DESCRIPTION OF THE EARTH'S MAGNETIC FIELD, OBTAINING DATA FOR USE IN THE UPDATE AND REFINEMENT OF WORLD AND REGIONAL MAGNETIC CHARTS, COMPILATION OF A GLOBAL CRUSTAL MAGNETIC ANOMALY MAP, AND INTERPRETATION OF THAT MAP IN TERMS OF GEOLOGIC/GEOPHYSICAL MODELS OF THE EARTH'S CRUST. THE SPACECRAFT WAS LAUNCHED INTO A LOW EARTH, NEAR POLAR, ORBIT BY THE SCOUT VEHICLE. THE BASIC SPACECRAFT WAS MADE UP OF TWO DISTINCT PARTS -- THE INSTRUMENT MODULE THAT CONTAINED A VECTOR AND A SCALAR MAGNETOMETER AND THEIR UNIQUE SUPPORTING GEAR; AND THE BASE MODULE THAT CONTAINED THE NECESSARY DATA HANDLING, POWER, COMMUNICATIONS, COMMAND, AND ATTITUDE CONTROL SUBSYSTEMS TO SUPPORT THE INSTRUMENT MODULE. THE BASE MODULE COMPLETE WITH ITS SUBSYSTEMS WAS COMPRISED OF RESIDUAL SMALL ASTRONOMY SATELLITE (SAS-C) HARDWARE. THE MAGNETOMETERS WERE DEPLOYED AFTER LAUNCH TO A POSITION 6 M BEHIND THE SPACECRAFT. AT THIS DISTANCE, THE INFLUENCE OF MAGNETIC MATERIALS FROM THE INSTRUMENT AND BASE MODULE (CHIEFLY FROM THE STAR CAMERAS) WAS LESS THAN 1 NT. FOR A LIST OF INVESTIGATORS AND THEIR INVESTIGATIONS, WHO WILL USE ONE OR BOTH OF THE EXPERIMENTS LISTED BELOW, SEE APPENDIX B.

\*\*\*\*\* MAGSAT, LANGE\*\*\*\*\*

INVESTIGATION NAME- SCALAR MAGNETOMETER

NSSDC ID- 79-094A-01

INVESTIGATIVE PROGRAM  
CODE ER/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
GEODYNAMICS

PERSONNEL

PI - R.A. LANGE  
OI - W.H. FARTHING

NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE SCALAR MAGNETOMETER HAD TWO DUAL-CELL, CESIUM-VAPOR SENSOR HEADS WHOSE OUTPUT FREQUENCY WAS PROPORTIONAL TO THE TOTAL MAGNETIC FIELD. WITH THIS SENSOR CONFIGURATION ONLY TWO SMALL DIAMOND-SHAPED DEAD ZONES EXIST. THESE LIE ALONG THE ORBIT NORMAL (THE EAST-WEST DIRECTION) FOR THE ORBIT AND ATTITUDE CHOSEN FOR THIS MISSION AND A DIRECTION IN WHICH THE MAGNETIC FIELD WILL NEVER LIE. THE SCALAR MAGNETOMETER'S BASIC ACCURACY WAS ON THE ORDER OF 0.5 NT. A PERIOD COUNT SYSTEM CONVERTED THE MAGNETOMETER OUTPUT FREQUENCY TO A DIGITAL WORD ACCEPTABLE TO THE SPACECRAFT TELEMETRY SYSTEM. THIS DIGITAL DATA HAD A RESOLUTION AND ACCURACY OF BETWEEN 0.5 AND 1.0 NT IN THE RANGE 15,000 TO 64,000 NT. NOISE ON THE SPACECRAFT RESULTED IN OPERATION OF ONLY ONE SENSOR AT A TIME MOST OF THE TIME.

\*\*\*\*\* MAGSAT, LANGE\*\*\*\*\*

INVESTIGATION NAME- VECTOR MAGNETOMETER

NSSDC ID- 79-094A-02

INVESTIGATIVE PROGRAM  
CODE ER/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
GEODYNAMICS

PERSONNEL

PI - R.A. LANGE  
OI - M.H. ACUNA

NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE VECTOR MAGNETOMETER CONSISTED OF THREE FLUXGATE SENSING ELEMENTS ALIGNED ALONG ORTHOGONAL AXES. THE OUTPUT OF EACH VECTOR SENSOR WAS CONVERTED TO A DIGITAL WORD BY AN ANALOG TO DIGITAL CONVERTER. THE OUTPUT OF ALL THESE AXES WAS SAMPLED ESSENTIALLY SIMULTANEOUSLY. EACH VECTOR MEASUREMENT HAD A RESOLUTION OF BETTER THAN 1 NT AND AN ABSOLUTE ACCURACY OF BETTER THAN 6 NT R.M.S. WHEN REFERENCED TO A GEOCENTRIC COORDINATE SYSTEM. THE MEASUREMENT RANGE WAS PLUS OR MINUS 64,000 NT.

\*\*\*\*\* METEOSAT\*\*\*\*\*

SPACECRAFT COMMON NAME- METEOSAT 1

ALTERNATE NAMES- METEOROLOGICAL SAT-A, METOSAT  
10489

NSSDC ID- 77-108A

LAUNCH DATE- 11/23/77  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

WEIGHT- 625.8 KG

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/24/77  
ORBIT PERIOD- 1411.5 MIN INCLINATION- 0.7 DEG  
PERIAPSIS- 34913. KM ALT APOAPSIS- 35692. KM ALT

PERSONNEL  
PM - D. LEVERINGTON

ESA

BRIEF DESCRIPTION

METEOSAT WAS A GEOSTATIONARY SPACECRAFT AND SERVED AS PART OF EUROPEAN SPACE AGENCY'S (ESA) CONTRIBUTION TO GARP. AS PART OF GARP, THE SATELLITE HELPED TO SUPPLY DATA REQUIRED FOR GLOBAL DATA SETS USED IN IMPROVEMENT OF MACHINE WEATHER FORECASTS. IN GENERAL, THE SPACECRAFT DESIGN, INSTRUMENTATION, AND OPERATION WERE SIMILAR TO SMS/GOES. THE SPIN-STABILIZED SPACECRAFT CARRIED (1) A VISIBLE-IR RADIOMETER TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA AND TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, (2) A METEOROLOGICAL DATA COLLECTION SYSTEM TO DISSEMINATE IMAGE DATA TO USER STATIONS, TO COLLECT DATA FROM VARIOUS EARTH-BASED PLATFORMS, AND TO RELAY DATA FROM POLAR ORBITING SATELLITES. THE CYLINDRICAL-SHAPED SPACECRAFT MEASURED 210 CM IN DIAMETER AND 430 CM IN LENGTH, INCLUDING THE AVOGEE BOOST MOTOR. THE PRIMARY STRUCTURAL MEMBERS WERE AN EQUIPMENT PLATFORM AND A CENTRAL TUBE. THE RADIOMETER TELESCOPE WAS MOUNTED ON THE EQUIPMENT PLATFORM AND VIEWED THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDED RADIALLY OUT FROM THE CENTRAL TUBE AND WAS AFFIXED TO THE SOLAR PANELS, WHICH FORMED THE OUTER WALLS OF THE SPACECRAFT AND PROVIDED THE PRIMARY SOURCE OF ELECTRICAL POWER.

LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE CENTRAL TUBE AND THE SOLAR PANELS WERE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT AND BATTERIES. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) WERE MAINTAINED BY JET THRUSTERS MOUNTED ON THE SPACECRAFT AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USED BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEMS. A LOW-POWER VHF TRANSPONDER PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT ATTAINED SYNCHRONOUS ORBIT. METEOSAT 1 WAS PLACED IN GEOSYNCHRONOUS ORBIT NEAR THE PRIME MERIDIAN AT AN ALTITUDE OF 39800 KM.

----- METEOSAT 1, ESA STAFF -----

INVESTIGATION NAME- IMAGING RADIOMETER

NSSDC ID- 77-108A-01

INVESTIGATIVE PROGRAM  
APPLICATIONS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - ESA STAFF

ESA

BRIEF DESCRIPTION

THE VISIBLE-IR RADIOMETER FLOWN ON METEOSAT WAS CAPABLE OF PROVIDING DAY/NIGHT OBSERVATIONS OF CLOUDCOVER AND EARTH/CLOUD RADIANCE TEMPERATURE MEASUREMENTS FROM A SYNCHRONOUS, SPIN-STABILIZED SATELLITE FOR USE IN (1) OPERATIONAL WEATHER ANALYSIS AND FORECASTING AND, (2) SUPPORT TO GARP. THE FIVE-CHANNEL INSTRUMENT WAS ABLE TO TAKE FULL PICTURES OF THE EARTH'S DISK. THE THREE IR CHANNELS (TWO IN THE 10.5- TO 12.5-MICRUMETER REGION AND ONE IN THE 5.7- TO 7.1-MICRUMETER REGION), AND THE TWO VISIBLE CHANNELS (0.5 TO 0.9 MICRUMETER) USED A COMPACT OPTICS SYSTEM. INCORPORATED RADIATION WAS RECEIVED BY A SCAN MIRROR AND COLLECTED BY AN OPTICAL SYSTEM. THE SCAN MIRROR WAS SET AT A NOMINAL ANGLE OF 45 DEG TO THE RADIOMETER OPTICAL AXIS, WHICH WAS ALIGNED PARALLEL TO THE SPIN AXIS OF THE SPACECRAFT. THE SPINNING MOTION OF THE SPACECRAFT (APPROXIMATELY 100 RPM) PROVIDED A WEST-EAST SCAN MOTION WHEN THE SPIN AXIS OF THE SPACECRAFT WAS ORIENTED PARALLEL WITH THE EARTH'S AXIS. THE LATITUDINAL SCAN WAS ACCOMPLISHED BY SEQUENTIALLY TILTING THE SCANNING MIRROR AT THE COMPLETION OF EACH SPIN. RESOLUTION AT THE SUBSATELLITE POINT WAS 2.5 KM FOR THE VISIBLE, 5 KM FOR THE IR AND WATER VAPOR CHANNELS.

----- METEOSAT 1, ESA STAFF -----

INVESTIGATION NAME- DATA COLLECTION PLATFORM (DCP)

NSSDC ID- 77-108A-02

INVESTIGATIVE PROGRAM  
APPLICATIONS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - ESA STAFF

ESA

BRIEF DESCRIPTION

THE DATA COLLECTION PLATFORM WAS DESIGNED TO (1) DISSEMINATE IMAGE DATA TO USER STATIONS, (2) COLLECT DATA FROM VARIOUS EARTH-BASED PLATFORMS, AND (3) PROVIDE FOR A SPACE-TO-SPACE RELAY FOR DATA FROM POLAR-ORBITING SATELLITES. THIS EXPERIMENT WAS SIMILAR TO THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM (WEFAX) FLOWN ON SMS 1, SMS 2, AND GOES SERIES SATELLITES. THIS EXPERIMENT OPERATED ON S-BAND FREQUENCIES FOR WEFAX TYPE TRANSMISSIONS AND UHF FOR DATA COLLECTION PLATFORM REPORT AND INTERROGATION.

\*\*\*\*\* NIMBUS 4 \*\*\*\*\* NIMBUS 4 \*\*\*\*\* NIMBUS 4 \*\*\*\*\*

SPACECRAFT COMMON NAME- NIMBUS 4

ALTERNATE NAMES- NIMBUS-D, PL-701E

04362

NSSDC ID- 70-025A

LAUNCH DATE- 04/08/70

WEIGHT- 620. KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY  
UNITED STATES

NASA-OSTA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC

EPOCH DATE- 04/09/70

ORBIT PERIOD- 107.2 MIN

INCLINATION- 80.114 DEG

PERIAPSIS- 1092. KM ALT

APOAPSIS- 1108. KM ALT

PERSONNEL

MG - R.J. ARNOLD  
PM - C.M. MACKENZIE  
PS - A.J. FLEIG

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

NIMBUS 4, THE FOURTH IN A SERIES OF SECOND-GENERATION METEOROLOGICAL A AND B SATELLITES, WAS DESIGNED TO SERVE AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR THE TESTING OF ADVANCED METEOROLOGICAL SENSOR SYSTEMS AND COLLECTING METEOROLOGICAL DATA. THE POLAR-ORBITING SPACECRAFT CONSISTED OF THREE MAJOR STRUCTURES -- (1) A RING-SHAPED SENSOR MOUNT, (2) SOLAR PADDLES, AND (3) THE CONTROL SYSTEM HOUSING. THE SOLAR PADDLES AND THE CONTROL SYSTEM CONNECTED TO THE SENSOR MOUNT BY A TRUSS STRUCTURE, GIVING THE SATELLITE THE APPEARANCE OF AN OCEAN BUOY. NIMBUS 4 WAS NEARLY 3.7 M TALL, 1.45 M IN DIAMETER AT THE BASE, AND ABOUT 3 M ACROSS WITH SOLAR PADDLES EXTENDED. THE TORUS-SHAPED SENSOR MOUNT, WHICH FORMED THE SATELLITE BASE, HOUSED THE ELECTRONICS EQUIPMENT AND BATTERY MODULES. THE LOWER SURFACE OF THE TORUS RING PROVIDED MOUNTING SPACE FOR SENSORS AND TELEMETRY ANTENNAS. AN H-FRAME STRUCTURE MOUNTED WITHIN THE CENTER OF THE TORUS PROVIDED SUPPORT FOR THE LARGER EXPERIMENTS AND TAPE RECORDERS, MOUNTED ON THE CONTROL SYSTEM HOUSING, WHICH WAS ON TOP OF THE SPACECRAFT, WERE SUN SENSORS, HORIZON SCANNERS, GAS NOZZLES FOR ATTITUDE CONTROL, AND A COMMAND ANTENNA. USE OF AN ADVANCED ATTITUDE CONTROL SUBSYSTEM PERMITTED THE SPACECRAFT'S ORIENTATION TO BE CONTROLLED TO WITHIN PLUS OR MINUS 1 DEG FOR ALL THREE AXES (PITCH, ROLL, AND YAW). PRIMARY EXPERIMENTS CONSISTED OF (1) AN IMAGE DISSECTOR CAMERA SYSTEM (IDCS) FOR PROVIDING DAYTIME CLOUDCOVER PICTURES BOTH IN REAL-TIME AND RECORDED MODES, (2) A TEMPERATURE-HUMIDITY INFRARED RADIOMETER (THIR) FOR MEASURING DAYTIME AND NIGHTTIME SURFACE AND CLOUDTOP TEMPERATURES AS WELL AS THE WATER VAPOR CONTENT OF THE UPPER ATMOSPHERE, (3) AN INFRARED INTERFEROMETER SPECTROMETER (IRIS) FOR MEASURING THE EMISSION SPECTRA OF THE EARTH/ATMOSPHERE SYSTEM, (4) A SATELLITE INFRARED SPECTROMETER (SIRS) FOR DETERMINING THE VERTICAL PROFILES OF TEMPERATURE AND WATER VAPOR IN THE ATMOSPHERE, (5) A MONITOR OF ULTRAVIOLET SOLAR ENERGY (NUSE) FOR DETECTING SOLAR UV RADIATION, (6) A BACKSCATTER ULTRAVIOLET (BUV) FOR MONITORING THE VERTICAL DISTRIBUTION AND TOTAL AMOUNT OF ATMOSPHERIC OZONE ON A GLOBAL SCALE, (7) A FILTER WEDGE SPECTROMETER (FWS) FOR ACCURATE MEASUREMENT OF IR RADIANCE AS A FUNCTION OF WAVELENGTH FROM THE EARTH/ATMOSPHERE SYSTEM, (8) A SELECTIVE CHOPPER RADIOMETER (SCR) FOR DETERMINING THE TEMPERATURES OF SIX SUCCESSIVE 10-KM LAYERS IN THE ATMOSPHERE FROM ABSORPTION MEASUREMENTS IN THE 15-MICRUMETER CO<sub>2</sub> BAND, AND (9) AN INTERROGATION, RECORDING, AND LOCATION SYSTEM (IRLS) FOR LOCATING, INTERROGATING, RECORDING, AND RETRANSMITTING METEOROLOGICAL AND GEOPHYSICAL DATA FROM REMOTE COLLECTION STATIONS.

----- NIMBUS 4, HEATH -----

INVESTIGATION NAME- BACKSCATTER ULTRAVIOLET (BUV)  
SPECTROMETER

NSSDC ID- 70-025A-05

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - D.F. HEATH  
OI - J.V. DAVE  
OI - A.J. KRUEGER  
OI - C.L. MATEER

NASA-GSFC  
IBM CORPORATION  
NASA-GSFC  
ENVIRONMENT CANADA

BRIEF DESCRIPTION

THE NIMBUS 4 BACKSCATTER ULTRAVIOLET (BUV) SPECTROMETER EXPERIMENT WAS DESIGNED TO MONITOR THE VERTICAL DISTRIBUTION AND TOTAL AMOUNT OF ATMOSPHERIC OZONE ON A GLOBAL SCALE BY MEASURING THE INTENSITY OF UV RADIATION BACKSCATTERED BY THE EARTH/ATMOSPHERE SYSTEM DURING DAY AND NIGHT IN THE 2500- TO 3400-A SPECTRAL BAND. THE PRIMARY INSTRUMENTATION CONSISTED OF A DOUBLE MONOCHROMATOR CONTAINING ALL REFLECTIVE OPTICS AND A PHOTOMULTIPLIER DETECTOR. THE DOUBLE MONOCHROMATOR WAS COMPOSED OF TWO FASTIE-EBERT-TYPE MONOCHROMATORS IN TANDEM. EACH MONOCHROMATOR HAD A 64"- BY 64-MM GRATINGS WITH 2400 LINES PER MM. LIGHT FRCP A 0.05-SR SOLID ANGLE (SUBTENDING APPROXIMATELY A 222-KM-SQUARE AREA ON THE EARTH'S SURFACE FROM A SATELLITE HEIGHT OF APPROXIMATELY 1100 KM) ENTERED THE NADIR-POINTING INSTRUMENT THROUGH A DEPOLARIZING FILTER. A MOTOR-DRIVEN CAR STEP ROTATED THE GRATINGS TO MONITOR THE INTENSITY OF 12 OZONE ABSORPTION WAVELENGTHS. THE DETECTOR WAS A PHOTOMULTIPLIER TUBE. FOR BACKGROUND READINGS, A FILTER PHOTOMETER MEASURED THE REFLECTED UV RADIATION IN AN OZONE-FREE ABSORPTION AREA NEAR 3800 A. SIGNALS FROM BOTH UNITS WERE READ BY SEPARATE RANGE-SWITCHING ELECTROMETERS WITH SEVEN RANGES. THE BUV EXPERIMENT CYCLE REQUIRED 6144 S. EACH CYCLE, IN TURN, WAS DIVIDED INTO 192 BUV FRAMES OF 32 S DURATION. CALIBRATION BY ONBOARD LIGHT SOURCES WAS PERFORMED IN 26 OF THE 192 FRAMES. THE OTHER FRAMES WERE USED FOR EXPERIMENTAL DATA. DURING EACH OF THESE DATA FRAMES, THE MONOCHROMATOR MEASURED THE INTENSITY OF THE UV RADIATION IN EACH OF THE 12 WAVELENGTH BANDS WHILE THE PHOTOMETER MEASURED THE UV INTENSITY IN A SINGLE WAVELENGTH BAND. THE DWELL TIME AT EACH WAVELENGTH WAS 1.8 S, AND, DURING THIS INTERVAL, FOUR ANALOG UV INTENSITY MEASUREMENTS WERE TAKEN AT 400-MS INTERVALS IN ADDITION TO AN INTEGRATED PULSE COUNT MEASUREMENT OF THE UV INTENSITY AND ENERGETIC PARTICLE FLUX. ONCE EACH ORBIT, THE FIELD OF VIEW WAS CHANGED TO MONITOR THE SUN OR MOON DIRECTLY. THE MEASUREMENT RANGE OF THE SIGNAL CURRENT WAS FROM 0.2 TO 3000 MICROAMPS. THE VERTICAL DISTRIBUTION OF OZONE WAS OBTAINED BY MATHEMATICAL INVERSION TECHNIQUES. FOR A COMPLETE DESCRIPTION OF THE BUV EXPERIMENT, SEE SECTION 7 IN 'THE NIMBUS IV USER'S GUIDE.'

\*\*\*\*\* NIMBUS 5 \*\*\*\*\*

NSSDC ID- 72-097A-04

INVESTIGATIVE PROGRAM  
CODE EB

SPACECRAFT COMMON NAME- NIMBUS 5  
ALTERNATE NAMES- NIMBUS-E, PL-7210  
06905

NSSDC ID- 72-097A

LAUNCH DATE- 12/11/72 WEIGHT- 770. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/11/72  
ORBIT PERIOD- 107.2 MIN INCLINATION- 99.9 DEG  
PERIAPSIS- 1089. KM ALT APOAPSIS- 1101. KM ALT

PERSONNEL

SC - R.J. ARNOLD NASA HEADQUARTERS  
PM - C.M. MACKENZIE NASA-GSFC  
PS - A.J. FLEIG NASA-GSFC

BRIEF DESCRIPTION

THE NIMBUS 5 R AND D SATELLITE WAS DESIGNED TO SERVE AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR THE TESTING OF ADVANCED METEOROLOGICAL SENSOR SYSTEMS AND COLLECTING METEOROLOGICAL AND GEOLOGICAL DATA ON A GLOBAL SCALE. THE POLAR-ORBITING SPACECRAFT CONSISTED OF THREE MAJOR STRUCTURES: (1) A HOLLOW TORUS-SHAPED SENSOR MOUNT, (2) SOLAR PADDLES, AND (3) A CONTROL SYSTEM HOUSING. THE SOLAR PADDLES AND CONTROL SYSTEM HOUSING WERE CONNECTED TO THE SENSOR MOUNT BY A TRUSS STRUCTURE, GIVING THE SATELLITE THE APPEARANCE OF AN OCEAN BUOY. NIMBUS 5 WAS NEARLY 3.7 M TALL, 1.5 M IN DIAMETER AT THE BASE, AND ABOUT 3 M WIDE WITH SOLAR PADDLES EXTENDED. THE TORUS-SHAPED SENSOR MOUNT, WHICH FORMED THE SATELLITE BASE, HOUSED THE ELECTRONICS EQUIPMENT AND BATTERY MODULES. THE LOWER SURFACE OF THE TORUS PROVIDED MOUNTING SPACE FOR SENSORS AND ANTENNAS. A BOX-BEAM STRUCTURE MOUNTED WITHIN THE CENTER OF THE TORUS PROVIDED SUPPORT FOR THE LARGER SENSOR EXPERIMENTS. MOUNTED ON THE CONTROL SYSTEM HOUSING, WHICH WAS LOCATED ON TOP OF THE SPACECRAFT, WERE SUN SENSORS, HORIZON SCANNERS, AND A COMMAND ANTENNA. AN ADVANCED ATTITUDE CONTROL SYSTEM PERMITTED THE SPACECRAFT ORIENTATION TO BE CONTROLLED TO WITHIN PLUS OR MINUS 1 DEG IN ALL THREE AXES. PRIMARY EXPERIMENTS INCLUDED (1) A TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR) FOR MEASURING DAY AND NIGHT SURFACE AND CLOUDTOP TEMPERATURES, AS WELL AS THE WATER VAPOR CONTENT OF THE UPPER ATMOSPHERE, (2) AN ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR) FOR MAPPING THE THERMAL RADIATION FROM THE EARTH'S SURFACE AND ATMOSPHERE, (3) AN INFRARED TEMPERATURE PROFILE RADIOMETER (ITPR) FOR OBTAINING VERTICAL PROFILES OF TEMPERATURE AND MOISTURE, (4) A MICROWAVE SPECTROMETER (NEMS) FOR DETERMINING TROPOSPHERIC TEMPERATURE PROFILES, ATMOSPHERIC WATER VAPOR ABUNDANCES, AND CLOUD LIQUID WATER CONTENTS, (5) A SELECTIVE CHOPPER RADIOMETER (SCR) FOR OBSERVING THE GLOBAL TEMPERATURE STRUCTURE OF THE ATMOSPHERE, AND (6) A SURFACE COMPOSITION MAPPING RADIOMETER (SCMR) FOR MEASURING THE DIFFERENCES IN THE THERMAL EMISSION CHARACTERISTICS OF THE EARTH'S SURFACE.

----- NIMBUS 5, HOUGHTON -----

INVESTIGATION NAME- SELECTIVE CHOPPER RADIOMETER (SCR)

NSSDC ID- 72-097A-02

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - J.T. HOUGHTON OXFORD U  
OI - S.D. SMITH READING U

BRIEF DESCRIPTION

THE NIMBUS 5 SELECTIVE CHOPPER RADIOMETER (SCR) WAS DESIGNED TO (1) OBSERVE THE GLOBAL TEMPERATURE STRUCTURE OF THE ATMOSPHERE UP TO 50 KM IN ALTITUDE, (2) MAKE SUPPORTING OBSERVATIONS OF WATER VAPOR DISTRIBUTION, AND (3) DETERMINE THE DENSITY OF ICE PARTICLES IN CIRRUS CLOUDS. TO ACCOMPLISH THESE OBJECTIVES, THE SCR MEASURED EMITTED RADIATION IN 16 SPECTRAL INTERVALS SEPARATED INTO THE FOLLOWING FOUR GROUPS - (1) FOUR CO<sub>2</sub> CHANNELS BETWEEN 13.8 AND 14.8 MICRORAMETERS (2) AN IR WINDOW CHANNEL AT 11.1 MICRORAMETERS AND A WATER VAPOR CHANNEL AT 18.6 MICRORAMETERS, (3) TWO CHANNELS AT 49.5 AND 133.5 MICRORAMETERS, AND (4) 2.08, 2.59, 2.65, AND 3.5 MICRORAMETERS. FROM AN AVERAGE SATELLITE ALTITUDE OF 1100 KM, THE RADIOMETER VIEWED A 48-KM CIRCLE ON THE EARTH'S SURFACE WITH A GROUND RESOLUTION OF ABOUT PLUS OR MINUS 1 DEG C. A SIMILAR EXPERIMENT WAS FLOWN ON NIMBUS 4.

----- NIMBUS 5, WILHEIT, JR. -----

INVESTIGATION NAME- ELECTRICALLY SCANNING MICROWAVE  
RADIOMETER (ESMR)

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - T.T. WILHEIT, JR.  
OI - P. GLOERSEN

NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE PRIMARY OBJECTIVES OF THE NIMBUS 5 ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR) WERE (1) TO DERIVE THE LIQUID WATER CONTENT OF CLOUDS FROM BRIGHTNESS TEMPERATURES OVER OCEANS, (2) TO OBSERVE DIFFERENCES BETWEEN SEA ICE AND THE OPEN SEA OVER THE POLAR CAPS, AND (3) TO TEST THE FEASIBILITY OF INFERRING SURFACE COMPOSITION AND SOIL MOISTURE. TO ACCOMPLISH THESE OBJECTIVES, THE ESMR WAS CAPABLE OF CONTINUOUS GLOBAL MAPPING OF THE 1.55-CM (19.36 GHZ) RADIO THERMAL (MICROWAVE) RADIATION EMITTED BY THE EARTH/ATMOSPHERE SYSTEM AND COULD FUNCTION EVEN IN THE PRESENCE OF CLOUD CONDITIONS THAT BLOCK CONVENTIONAL SATELLITE INFRARED SENSORS. A 90-BY 90-CM RADIOMETER ANTENNA SYSTEM, DEPLOYED AFTER LAUNCH, SCANNED THE EARTH SUCCESSIVELY AT VARIOUS ANGLES IN A PLANE PERPENDICULAR TO THE SPACECRAFT ORBITAL TRACK, PRODUCING A BRIGHTNESS TEMPERATURE MAP OF THE SURFACE OF THE EARTH AND ITS ATMOSPHERE. THE SCANNING PROCESS WAS CONTROLLED BY A COMPUTER ON BOARD AND CONSISTED OF 78 SYMMETRICALLY DISTRIBUTED INDEPENDENT SCAN SPOTS EXTENDING 50 DEG TO EITHER SIDE OF NADIR. ANGULAR SEPARATION OF THE SCAN SPOTS ALLOWED FOR AN 8.5 PERCENT OVERLAP BETWEEN VIEW POSITIONS. FROM A MEAN ORBITAL HEIGHT OF 1100 KM, THE RADIOMETER HAD AN ACCURACY OF ABOUT PLUS OR MINUS 1 DEG C WITH A SPATIAL RESOLUTION OF ABOUT 25 KM. THE ESMR DATA WERE STORED ON MAGNETIC TAPE FOR TRANSMISSION TO GROUND ACQUISITION STATIONS.

\*\*\*\*\* NIMBUS 6 \*\*\*\*\*

SPACECRAFT COMMON NAME- NIMBUS 6  
ALTERNATE NAMES- PL-7310, NIMBUS-F  
07924

NSSDC ID- 75-052A

LAUNCH DATE- 06/12/75 WEIGHT- 585. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/12/75  
ORBIT PERIOD- 107.3 MIN INCLINATION- 100. DEG  
PERIAPSIS- 1093. KM ALT APOAPSIS- 1101. KM ALT

PERSONNEL

RG - R.J. ARNOLD NASA HEADQUARTERS  
PM - C.M. MACKENZIE NASA-GSFC  
PS - A.J. FLEIG NASA-GSFC

BRIEF DESCRIPTION  
THE NIMBUS 6 R AND D SATELLITE SERVED AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR TESTING ADVANCED SYSTEMS FOR SENSING AND COLLECTING METEOROLOGICAL DATA ON A GLOBAL SCALE. THE POLAR-ORBITING SPACECRAFT CONSISTED OF THREE MAJOR STRUCTURES: (1) A HOLLOW TORUS-SHAPED SENSOR MOUNT, (2) SOLAR PADDLES, AND (3) A CONTROL HOUSING UNIT CONNECTED TO THE SENSOR MOUNT BY A TRIPOD TRUSS STRUCTURE. CONFIGURED SOMEWHAT LIKE AN OCEAN BUOY, NIMBUS 6 WAS NEARLY 3.7 M TALL, 1.5 M IN DIAMETER AT THE BASE, AND ABOUT 3 M WIDE WITH SOLAR PADDLES EXTENDED. THE SENSOR MOUNT THAT FORMED THE SATELLITE BASE HOUSED THE ELECTRONICS EQUIPMENT AND BATTERY MODULES. THE LOWER SURFACE OF THE TORUS PROVIDED MOUNTING SPACE FOR SENSORS AND ANTENNAS. A BOX-BEAM STRUCTURE MOUNTED WITHIN THE CENTER OF THE TORUS SUPPORTED THE LARGER SENSOR EXPERIMENTS. MOUNTED ON THE CONTROL HOUSING UNIT, WHICH WAS LOCATED ON TOP OF THE SPACECRAFT, WERE SUN SENSORS, HORIZON SCANNERS, AND A COMMAND ANTENNA. AN ADVANCED ATTITUDE CONTROL SYSTEM PERMITTED THE SPACECRAFT'S ORIENTATION TO BE CONTROLLED TO WITHIN PLUS OR MINUS 1 DEG IN ALL THREE AXES (PITCH, ROLL, AND YAW). THE NINE EXPERIMENTS SELECTED FOR NIMBUS 6 ARE THE (1) EARTH RADIATION BUDGET (ERB), (2) ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR), (3) HIGH-RESOLUTION INFRARED RADIATION SOUNDER (HIRS), (4) LIMB RADIANCE INVERSION RADIOMETER (LRIR), (5) PRESSURE MODULATED RADIOMETER (PMR), (6) SCANNING MICROWAVE SPECTROMETER (SCAMS), (7) TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR), (8) SATELLITE TRACKING AND DATA RELAY EXPERIMENT, AND (9) TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL EXPERIMENT (TWERLE). THIS COMPLEMENT OF ADVANCED SENSORS IS CAPABLE OF (1) MAPPING TROPOSPHERIC TEMPERATURE, WATER VAPOR ABUNDANCE, AND CLOUD WATER CONTENT, (2) PROVIDING VERTICAL PROFILES OF TEMPERATURE, OZONE, AND WATER VAPOR, (3) TRANSMITTING REAL-TIME DATA TO A GEOSTATIONARY SPACECRAFT (ATS 6), AND (4) YIELDING DATA ON THE EARTH'S RADIATION BUDGET.

----- NIMBUS 6: HOUGHTON -----

INVESTIGATION NAME- PRESSURE-MODULATED RADIOMETER (PMR)

NSSDC ID- 75-052A-09

INVESTIGATIVE PROGRAM  
CODE EB/CU-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - J.T. HOUGHTON  
OI - C.D. RODGERS  
OI - E.J. WILLIAMSON  
DI - G.D. PESKETT  
OI - P. CURTIS

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OXFORD U

BRIEF DESCRIPTION

THE NIMBUS 6 PRESSURE MODULATED RADIOMETER (PMR) EXPERIMENT TOOK RADIOMETRIC MEASUREMENTS IN THE 15-MICROMETER CO<sub>2</sub> BAND AT ALTITUDES BETWEEN 45 AND 70 KM ON A GLOBAL SCALE. BY APPROPRIATE MATHEMATICAL RETRIEVAL METHODS, THE TEMPERATURE STRUCTURES OF THE UPPER STRATOSPHERE AND LOWER MESOSPHERE WERE THEN DEDUCED. THE PRESSURE MODULATION TECHNIQUE PERMITTED THE EXTENSION OF SELECTIVE CHOPPING TECHNIQUES TO HIGHER ALTITUDES WHERE THE PRESSURE-BROADENED EMISSION LINES IN THE 15-MICROMETER CO<sub>2</sub> BAND BECAME SO NARROW THAT CONVENTIONAL SPECTROMETERS AND INTERFEROMETERS HAD INSUFFICIENT SPECTRAL RESOLUTION. IN ADDITION TO PRESSURE SCANNING (IN DISCRETE STEPS), THE RADIOMETER ALSO EMPLOYED DOPPLER SCANNING ALONG THE DIRECTION OF FLIGHT. THE PMR COMPRISED TWO SIMILAR RADIOMETER CHANNELS, EACH CONSISTING OF A PLANE SCANNING MIRROR, REFERENCE BLACKBODY, PRESSURE MODULATOR CELL, AND DETECTOR ASSEMBLY. THE PLANE MIRROR WAS GOLD-COATED AND MOUNTED AT 45 DEG ON A 90-DEG STEPPING MOTOR SO THAT THE FIELD OF VIEW OF THE CHANNEL COULD BE DIRECTED TO SPACE OR TO THE INTERNAL REFERENCE BLACKBODY FOR INFLIGHT RANGE AND ZERO CALIBRATION. THE MOTOR WAS MOUNTED ON A PAIR OF FLEXIBLE PIVOTS SO THAT THE MIRROR CAN BE ROTATED THROUGH PLUS OR MINUS 7-1/2 DEG FROM ITS REST POSITION TO GIVE THE REQUIRED DOPPLER SCAN. MAJOR COMPONENTS IN THE PRESSURE MODULATOR CELL WERE A MOVEABLE PISTON, A DIAPHRAGM, AND A MAGNETIC DRIVE COIL. THE DETECTOR ASSEMBLY CONSISTED OF A FIELD LENS, A CONDENSING LIGHT PIPE, AND A PYROELECTRIC FLAKE BOLOMETER. EACH RADIOMETER HAD A FIELD OF VIEW THAT WAS 20 DEG WHOLE ANGLE ACROSS THE SPACECRAFT'S LINE OF FLIGHT AND 40 DEG WHOLE ANGLE PARALLEL TO THE LINE OF FLIGHT. THE REDUCED TEMPERATURE VALUES WERE WITHIN PLUS OR MINUS 2 DEG K AT 65 KM AND ABOUT PLUS OR MINUS 0.2 DEG K NEAR 50 KM.

----- NIMBUS 6: JACOBOWITZ -----

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 75-052A-05

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - H. JACOBOWITZ  
OI - A.J. DRUMMOND  
OI - I. RUFF  
OI - J.R. HICKY  
OI - W.J. SCHODES  
OI - L.L. STOWE

NOAA-NESS  
EPPELEY LAB., INC  
NOAA-NESS  
EPPELEY LAB., INC  
EPPELEY LAB., INC  
NOAA-NESS

BRIEF DESCRIPTION

THE NIMBUS 6 EARTH RADIATION BUDGET (ERB) EXPERIMENT MEASURED REFLECTED AND EMITTED TERRESTRIAL RADIATION FLUXES IN CONJUNCTION WITH SOLAR RADIATION. THE RESULTS WERE USED (1) TO DETERMINE THE EARTH RADIATION BUDGET, (2) TO DETERMINE THE ANGULAR DISTRIBUTION OF TERRESTRIAL RADIATION FOR VARIOUS METEOROLOGICAL AND GEOGRAPHIC REGIMES, AND (3) TO CORRELATE MEASUREMENTS MADE USING IDENTICAL BUT INDEPENDENT CHANNELS CALIBRATED TO THE SAME STANDARD. INCOMING SOLAR RADIATION FROM 0.2 TO 50 MICROMETERS WAS NORMALLY MONITORED IN 10 SPECTRAL INTERVALS SEVERAL TIMES EACH DAY AND EVERY ORBIT DURING PERIODS OF SOLAR ACTIVITY. TERRESTRIAL RADIATION MEASUREMENTS WERE TAKEN CONTINUOUSLY IN THE 0.2 AND 4 MICRUMETER, 0.7 TO 3 MICRUMETER, AND 4 TO 50 MICRUMETER INTERVALS. THE MEASUREMENTS WERE TAKEN IN TWO WAYS. FOUR CHANNELS, USING WIDE-ANGLE OPTICS (133.3-DEG FIELD OF VIEW), MEASURED THE TOTAL OUTGOING RADIATION INTEGRATED OVER THE ENTIRE EARTH DISK. THE SECOND SET OF MEASUREMENTS WAS OBTAINED FOR EIGHT HIGH-RESOLUTION SCANNING CHANNELS THAT MEASURED THE TERRESTRIAL RADIATION EMANATING FROM RELATIVELY SMALL AREA OVER A RANGE OF VARIOUS ZENITH AND AZIMUTH ANGLES. THE MULTICHANNEL RADIOMETER EMPLOYED A BI-AXIAL SCANNING MECHANISM WHICH ENABLED MEASUREMENTS TO BE OBTAINED FROM THE FORWARD HORIZON TO THE AFT HORIZON IN A 64-S INTERVAL. EACH AXIS OF THE SCANNING MECHANISM CONTAINED FOUR SHORTWAVE CHANNELS (0.2 TO 4.0 MICRUMETER) AND FOUR LONGWAVE CHANNELS (4.0 TO 50 MICRUMETER) WITH A 0.25- BY 5.24-DEG FIELD OF VIEW. THE CHANNELS WERE ORIENTED IN A DIRECTIONAL FAN TO COVER 20 DEG TO EACH SIDE OF THE ORBITAL PLANE. THE 64-S SCAN PERIOD ALLOWED AN AREA TO BE MEASURED FROM UP TO 17 DIFFERENT ANGLES AS THE SPACECRAFT PASSED OVERHEAD.

----- NIMBUS 6: JULIAN -----

INVESTIGATION NAME- TROPICAL WIND ENERGY CONVERSION AND  
REFERENCE LEVEL (TWERLE)

NSSDC ID- 75-052A-01

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - P. JULIAN  
OI - W.W. KELLOGG  
OI - V.E. SUOMI  
OI - C.R. LAUGHLIN  
OI - R.L. TALLEY  
OI - W.B. BANDEEN  
OI - C.E. COTE

NASA CTR FOR ATROS RES  
NATO CTR FOR ATROS RES  
U OF WISCONSIN  
NASA-GSFC  
SIGMA DATA SERV CORP  
NASA-GSFC

BRIEF DESCRIPTION

THE GOALS OF THE NIMBUS 6 TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL EXPERIMENT (TWERLE) WERE CLOSELY ASSOCIATED WITH THE OBJECTIVES OF GARP AND INCLUDED (1) MEASURING UPPER ATMOSPHERIC WINDS OVER REMOTE REGIONS, (2) STUDYING THE RELATIVE AIR MOTION ALONG ISOBARIC SURFACES TO DETERMINE THE RATE OF CONVERSION OF ATMOSPHERIC POTENTIAL ENERGY INTO KINETIC ENERGY, AND (3) PROVIDING DIRECT MEASUREMENTS OF VARIOUS METEOROLOGICAL PARAMETERS THAT CAN SERVE AS REFERENCE POINTS IN ADJUSTING INDIRECT TEMPERATURE SOUNDINGS MADE FROM SATELLITES. THE EXPERIMENT CONSISTED OF TWO BASIC COMPONENTS: (1) APPROXIMATELY 300 CONSTANT LEVEL METEOROLOGICAL BALLOONS TO YIELD MEASUREMENTS OF WINDS, TEMPERATURE, AND PRESSURE IN THE TROPICS AND AT SOUTHERN HEMISPHERE MIDLATITUDES AT 150 MB (ABOUT 13.6-KM ALTITUDE), AND (2) THE NIMBUS 6 RANDOM ACCESS MEASUREMENTS SYSTEM (RAMS) TO PROVIDE DATA COLLECTION AND LOCATION DETERMINATIONS FROM THE BALLOONS. THE 3.5-M-DIAM POLYESTER-MYLAR BALLOONS WERE EQUIPPED WITH A TRANSMITTER PACKAGE, SOLAR POWER SUPPLY, DIGITIZER/MODULATOR, AND SENSORS. THE SENSORS CONSISTED OF A RADIO ALTIMETER HAVING AN ACCURACY OF BETTER THAN PLUS OR MINUS 20 M, A BEAD THERMISTOR MONITORING THE AMBIENT AIR TEMPERATURE TO AN ACCURACY OF PLUS OR MINUS 0.5 DEG C, AND A PRESSURE SENSOR MEASURING THE 150-MB FLIGHT ALTITUDE TO AN ACCURACY OF PLUS OR MINUS 0.5 MB. A MAGNETIC CUTDOWN DEVICE WAS ALSO INCLUDED ON EACH BALLOON TO ELIMINATE ANY ACCIDENTAL OVERFLIGHTS INTO REGIONS OF THE NORTHERN HEMISPHERE NORTH OF 20 DEG N LATITUDE. THE RAMS ON BOARD THE SPACECRAFT HAD NO COMMAND OR CONTROL CAPABILITY OVER THE BALLOONS (THE BALLOONS WERE NOT INTERROGATED). IT MERELY DETECTED EACH BALLOON SIGNAL (401.2 MHZ) AND EXTRACTED THE CARRIER FREQUENCY, BALLOON IDENTIFICATION, AND SENSOR DATA. THIS INFORMATION, ALONG WITH TIME REFERENCES, WAS STORED IN DIGITAL FORM FOR SUBSEQUENT RELAY TO A GROUND ACQUISITION STATION. THE BALLOON'S POSITION AND VELOCITY WERE DERIVED FROM THE RELATIVE MOTION BETWEEN THE PLATFORM AND THE SATELLITE BY MEASURING DOPPLER SHIFTS IN THE CARRIER SIGNAL RECEIVED FROM THE BALLOON. TWERLE WAS CAPABLE OF A LOCATION ACCURACY OF 5 KM AND A PLATFORM VELOCITY ACCURACY OF 1 M/S.

\*\*\*\*\* NIMBUS 7 \*\*\*\*\*

SPACERCAFT COMMON NAME- NIMBUS 7  
ALTERNATE NAMES- 11200, NIMBUS-G

NSSDC ID- 78-098A

LAUNCH DATE- 10/24/78  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 104.0 MIN  
PERIAPSIS- 938. KM ALT  
EPOCH DATE- 10/25/78  
INCLINATION- 99.5 DEG  
APOAPSIS- 955. KM ALT

PERSONNEL  
SC - R.J. ARNOLD  
PM - C.M. MACKENZIE  
PS - A.J. FLEIG

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE NIMBUS 7 RESEARCH AND DEVELOPMENT SATELLITE SERVED AS A STABILIZED, EARTH-ORIENTED PLATFORM FOR THE TESTING OF ADVANCED SYSTEMS FOR SENSING AND COLLECTING METEOROLOGICAL DATA ON A GLOBAL SCALE. THE POLAR-ORBITING SPACECRAFT CONSISTED OF THREE MAJOR STRUCTURES: (1) A HOLLOW TORUS-SHAPED SENSOR MOUNT, (2) SOLAR PADDLES, AND (3) A CONTROL HOUSING UNIT THAT IS CONNECTED TO THE SENSOR MOUNT BY A TRIPOD TRUSS STRUCTURE. CONFIGURED SOMEWHAT LIKE AN OCEAN BUOY, NIMBUS 7 IS NEARLY 3.7 M TALL, 1.5 M IN DIAMETER AT THE BASE, AND ABOUT 3 M WIDE WITH SOLAR PADDLES EXTENDED. THE SENSOR MOUNT THAT FORMS THE SATELLITE BASE HOUSED THE ELECTRONICS EQUIPMENT AND BATTERY MODULES. THE LOWER SURFACE OF THE TORUS PROVIDED MOUNTING SPACE FOR SENSORS AND ANTENNAS. A BOX-BEAM STRUCTURE MOUNTED WITHIN THE CENTER OF THE TORUS PROVIDED SUPPORT FOR THE LARGER SENSOR EXPERIMENTS. MOUNTED ON THE CONTROL HOUSING UNIT, WHICH WAS LOCATED ON TOP OF THE SPACECRAFT, WERE SUN SENSORS, HORIZON SCANNERS, AND A COMMAND ANTENNA. AN ADVANCED ATTITUDE CONTROL SYSTEM PERMITTED THE SPACECRAFT'S ORIENTATION TO BE CONTROLLED

TO WITHIN PLUS OR MINUS 1 DEG IN ALL THREE AXES (PITCH, ROLL, AND YAW). EIGHT EXPERIMENTS WERE SELECTED: (1) LIDAR INFRARED MONITORING OF THE STRATOSPHERE LIMS, (2) STRATOSPHERIC AND MESOSPHERIC SOUNDER SAMS, (3) COASTAL ZONE COLOR SCANNER CZCS, (4) STRATOSPHERIC AEROSOL MEASUREMENT II SAMS II, (5) EARTH RADIATION BUDGET ERB, (6) SCANNING MULTICHANNEL MICROWAVE RADIOMETER SMRR, (7) SOLAR BACKSCATTER UV AND TOTAL OZONE MAPPING SPECTROMETER SBUV/TOMS, AND (8) TEMPERATURE-HUMIDITY INFRARED RADIOMETER THIR. THESE SENSORS WERE CAPABLE OF OBSERVING SEVERAL PARAMETERS OF IMPORTANCE AT AND BELOW THE MESOSPHERIC LEVELS. A NEW CAPABILITY OF IMPORTANCE WAS DIRECTED TOWARD OBSERVATION OF ATMOSPHERIC AND OCEAN POLLUTANTS. SUFFICIENT RUNTIME WAS PLANNED FOR SEGMENTAL MAPS (IMAGERY) OF THE PARAMETERS AVAILABLE FOR STUDY.

----- NIMBUS 7, ALLISON -----

INVESTIGATION NAME- TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)

NSSDC ID- 78-098A-10 INVESTIGATIVE PROGRAM CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - L.J. ALLISON

NASA-GSFC

BRIEF DESCRIPTION

THE THIR EXPERIMENT OBJECTIVES WERE TO MEASURE THE INFRARED RADIATION FROM THE EARTH IN TWO SPECTRAL BANDS DURING BOTH DAY AND NIGHT PORTIONS OF THE ORBIT TO PROVIDE PICTURES OF THE CLOUD COVER, THREE-DIMENSIONAL MAPPINGS OF THE CLOUD COVER, AND TEMPERATURE MAPPINGS OF THE CLOUDS, LAND AND OCEAN SURFACES, CIRRUS CLOUD CONTENT, AND ATMOSPHERIC CONTAMINATION AND MOISTURE. THE NIMBUS 7 TEMPERATURE-HUMIDITY INFRARED RADIOMETER (THIR) DETECTED EMITTED THERMAL RADIATION IN BOTH THE 10.5- TO 12.5-MICRUMETER REGION (IR WINDOW) AND THE 6.5- TO 7.0-MICRUMETER REGION (WATER VAPOR). THE WINDOW CHANNEL MEASURED CLOUDTOP TEMPERATURES AND WAS CAPABLE OF PRODUCING HIGH-RESOLUTION PICTURES OF CLOUDBREAK AND THERMAL GRADIENTS ON LAND AND WATER SURFACES IN CLOUD-FREE AREA DURING BOTH THE DAY AND NIGHT PORTIONS OF THE ORBIT. THE OTHER CHANNEL OPERATED TO MAP THE WATER VAPOR DISTRIBUTION IN THE UPPER TROPOSPHERE AND STRATOSPHERE. DATA FROM THESE TWO CHANNELS WERE USED PRIMARILY TO SUPPORT OTHER, MORE SOPHISTICATED, METEOROLOGICAL EXPERIMENTS ONBOARD NIMBUS 7. THE INSTRUMENT CONSISTED OF A 12.7-CM CASSEGRAIN SYSTEM AND SCANNING MIRROR COMMON TO BOTH CHANNELS, A BEAM SPLITTER, FILTERS, AND TWO GERMANIUM-IMMERSED THERMISTOR BOLMETERS. IN CONTRAST TO TV, NO IMAGE WAS FORMED WITHIN THE RADIOMETER. INCOMING RADIANT ENERGY WAS COLLECTED BY A FLAT SCANNING MIRROR INCLINED AT 45 DEG TO THE OPTICAL AXIS. THE MIRROR ROTATES THROUGH 360 DEG AT 48 RPM AND SCANNED IN A PLANE NORMAL TO THE SPACECRAFT VELOCITY. THE ENERGY THEN WAS FOCUSED ON A DICHOICIC BEAM SPLITTER WHICH DIVIDED THE ENERGY SPECTRALLY AND SPATIALLY. THE TWO CHANNELS OF THIS SENSOR TRANSFORMED THE RECEIVED RADIATION INTO ELECTRIC OUTPUT (VOLTAGES), WHICH WERE RECORDED ON MAGNETIC TAPE FOR SUBSEQUENT PLAYBACK TO A GROUND ACQUISITION STATION.

----- NIMBUS 7, GLOERSEN -----

INVESTIGATION NAME- SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMRR)

NSSDC ID- 78-098A-08

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
ATMOSPHERIC PHYSICS  
OCEANOGRAPHY

PERSONNEL

PI - P. GLOERSEN

NASA-GSFC

TM - R.O. RAASER

ENVIRONMENT CANADA

TM - D.H. STAELIN

MASS INST OF TECH

TM - W.J. CAMPBELL

US GEOLOGICAL SURVEY

TM - D.B. ROSS

NOAA-ERL

TM - P. GUDEHANSEN

TECH U OF DENMARK

TM - F.T. BARATH

NASA-JPL

TM - T.T. WILHEIT, JR.

NASA-GSFC

BRIEF DESCRIPTION

THE PRIMARY PURPOSE OF THE SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMRR) WAS TO OBTAIN AND USE OCEAN MOMENTUM AND ENERGY-TRANSFER PARAMETERS ON A NEARLY ALL-WEATHER OPERATIONAL BASIS. WINDS, WATER VAPOR, LIQUID WATER CONTENT, AND MEAN CLOUD DROPLET SIZE, ALL AT LOW ALTITUDES, WERE PARAMETERS WHICH WERE DERIVED. OCEAN ICE VS WATER WAS ALSO DETERMINED. MICROWAVE BRIGHTNESS TEMPERATURES WERE OBSERVED WITH A 10-CHANNEL (FIVE-FREQUENCY, DUAL POLARIZED) SCANNING RADIOMETER OPERATION AT 0.8-, 1.4-, 1.7-, 2.0-, AND 4.6-CM WAVELENGTHS (37, 21, 18, 10.6, 6.63 GHZ). THE ANTENNA WAS A PARABOLIC REFLECTOR OFFSET FROM NADIR BY 0.73 RAD. MOTION OF THE ANTENNA REFLECTOR PROVIDED OBSERVATIONS FROM WITHIN CONICAL VOLUME ALONG THE GROUND TRACK OF THE SPACECRAFT. THE SAME INSTRUMENT WAS ON SEASAT 1.

----- NIMBUS 7, HEATH -----

INVESTIGATION NAME- SOLAR AND BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SYSTEM (SBUV/TOMS)

NSSDC ID- 78-098A-09

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
SOLAR PHYSICS

PERSONNEL

PI - D.F. HEATH  
TM - C.L. RATEER  
TM - A.D. BELMONT  
TM - A.J. MILLER  
TM - A.E.S. GREEN  
TM - D.M. CUNNOLD  
TM - W.L. INHOFF  
TM - A.J. KRUEGER

NASA-GSFC  
ENVIRONMENT CANADA  
CONTROL DATA CORP  
NOAA-NMC  
U OF FLORIDA  
GEORGIA INST OF TECH  
LOCKHEED PALO ALTO  
NASA-GSFC

BRIEF DESCRIPTION

THE OBJECTIVES OF THE SBUV/TOMS WERE TO DETERMINE THE VERTICAL DISTRIBUTION OF OZONE, MAP THE TOTAL OZONE AND 200-MB HEIGHT FIELDS, AND MONITOR THE INCIDENT SOLAR ULTRAVIOLET (UV) IRRADIANCE AND ULTRAVIOLET RADIATION BACKSCATTERED FROM THE EARTH. THE SBUV SPECTROMETER MEASURED SOLAR UV THAT IS BACKSCATTERED BY THE EARTH'S ATMOSPHERE AT 12 WAVELENGTHS BETWEEN 2500 AND 3300 A WITH A SPECTRAL BAND PASS OF 10 A. THE INSTRUMENT FOV OF 0.20 RAD WAS DIRECTED AT THE NADIR. A PARALLEL PHOTOMETER CHANNEL AT 3400 A MEASURED THE REFLECTIVITY OF THE ATMOSPHERE'S LOWER BOUNDARY IN THE SAME 0.21-RAD FOV. BOTH CHANNELS ALSO VIEWED THE SUN FOR CALIBRATION THROUGH THE USE OF A DIFFUSER PLATE DEPLOYED NEAR THE TERMINATOR. THE CONTRIBUTION FUNCTIONS FOR THE EIGHT SHORTEST WAVELENGTHS WERE CENTERED AT LEVELS RANGING FROM 55 TO 28 KM AND WERE USED TO INFER THE VERTICAL OZONE PROFILE. THE FOUR LONGEST WAVELENGTHS HAD CONTRIBUTION FUNCTIONS IN THE TROPOSPHERE WHICH WERE USED TO COMPUTE THE TOTAL OZONE AMOUNT. THE SBUV SPECTROMETER HAD A SECOND MODE OF OPERATION THAT ALLOWED A CONTINUOUS SPECTRAL SCAN FROM 1600 TO 4000 A FOR DETAILED EXAMINATION OF THE EXTRATERRESTRIAL SOLAR SPECTRUM AND THEIR TEMPORAL VARIATIONS. THE TOMS SYSTEMS, OPERATING IN PARALLEL WITH THE SBUV, STEP SCANNED ACROSS A 105-DEG FOV NORMAL TO THE ORBITAL TRACK WITH AN FOV OF APPROXIMATELY 0.052 RAD. AT EACH SCAN POSITION THE EARTH RADIANCE WAS MONITORED AT SIX WAVELENGTHS BETWEEN 3100 AND 3800 A TO INFER THE TOTAL OZONE AMOUNT. THE INSTRUMENT CONSISTED PRINCIPALLY OF THREE EBERT-FASTIE MONOCHROMETERS, TWO OF WHICH WERE OPERATED IN TANDEM FOR STRAY LIGHT REJECTION. TOMS USED THE THIRD MONOCHROMETER, WHICH WAS EQUIPPED WITH A SPATIAL SCAN MECHANISM AT THE ENTRANCE SLIT. THE SIGNAL-TO-NOISE RATIO OF THE SBUV WAS GREATER THAN 5.03. THE TOMS SIGNAL-TO-NOISE RATIO WAS GREATER THAN 1.05.

----- NIMBUS 7, HOUGHTON -----

INVESTIGATION NAME- STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS)

NSSDC ID- 78-098A-02

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY

PERSONNEL

PI - J.T. HOUGHTON  
OI - G.D. PESKETT  
OI - C.D. RODGERS  
OI - E.J. WILLIAMSON

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OXFORD U  
OXFORD U  
OXFORD U

BRIEF DESCRIPTION

THE OBJECTIVE OF SAMS WAS TO OBSERVE EMISSION FROM THE LIMB OF THE ATMOSPHERE THROUGH VARIOUS PRESSURE MODULATOR RADIOMETERS AND TO DETERMINE TEMPERATURE AND VERTICAL CONCENTRATIONS OF H<sub>2</sub>O, N<sub>2</sub>O, CH<sub>4</sub>, CO, AND NO IN THE STRATOSPHERE AND MESOSPHERE TO APPROXIMATELY 90 KP. MEASUREMENTS OF ZONAL WIND IN THIS REGION WERE ATTEMPTED BY OBSERVING THE DOPPLER SHIFT OF ATMOSPHERIC EMISSION LINES. RADIATION FROM THE LIMB OF THE ATMOSPHERE WAS INCIDENT ON A TELESCOPE OF 15-CM APERTURE. IN FRONT OF THE TELESCOPE A PLANE MIRROR SCANNED THE LIMB, VIEWED SPACE FOR CALIBRATION, AND VIEWED THE ATMOSPHERE OBLIQUELY TO OBTAIN VERTICAL PROFILES. THREE ADJACENT FIELDS OF VIEW, EACH 28 BY 2.6 MRAD (CORRESPONDING TO 100 KM BY 10 KM AT THE LIMB), FOCUSED ONTO A FIELD-SPLITTING MIRROR WHICH DIRECTED RADIATION TO SIX DETECTORS. THE REMAINING DIVISION INTO CHANNELS WAS ACCOMPLISHED THROUGH DICHOICIC BEAM SPLITTERS. THERE WERE SEVEN PRESSURE MODULATOR CELLS (PMC), TWO CONTAINING CO<sub>2</sub>, THE REMAINDER N<sub>2</sub>O, NO, CH<sub>4</sub>, CO, H<sub>2</sub>O. PRESSURE IN THE CELLS COULD BE VARIED ON COMMAND BY CHANGING THE TEMPERATURE OF A SMALL CONTAINER OF MOLECULAR SIEVE MATERIAL ATTACHED TO EACH PMC. THE SPECTRAL PARAMETERS FOR THE H<sub>2</sub>O CHANNEL WERE 2.7 MICRUMETERS AND 25 TO 100 MICRUMETERS. ALL OTHER CHANNELS LAY WITHIN THE RANGE OF 4.1 TO 15 MICRUMETERS. WITHIN THE TELESCOPE, A CHOPPER OPERATING AT 250 Hz ALLOWED MEASUREMENT OF TWO SEPARATE SIGNALS FROM ALL DETECTORS, ONE AT 250 Hz AND ONE AT THE PMC FREQUENCY. COMPARISON OF THESE SIGNALS PERMITTED ELIMINATING EMISSION FROM INTERFERING GASES WITHIN A PARTICULAR SPECTRAL INTERVAL. IN FRONT OF THE CHOPPER A SMALL BLACK BODY AT KNOWN TEMPERATURE COULD BE INTRODUCED FOR CALIBRATION. ACCURATE MEASUREMENT OF THE ATMOSPHERIC PRESSURE AT THE LEVEL

BEING VIEWED WAS OBTAINED FROM THE TWO SIGNALS FROM ONE CO2 CHANNEL.

----- NIMBUS 7, NOVIS -----

INVESTIGATION NAME- COASTAL ZONE COLOR SCANNER (CZCS)

NSSDC ID- 78-098A-03

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL

TL - W.A. MOVIS	NOAA-NESS
TM - H.L. RICHARD	NASA-GSFC
TM - C.S. VENTSCH	BIGELOW LAB OCEAN SCI
TM - D. CLARK	NOAA-NESS
TM - J.R. APEL	NOAA-PHEL
TM - S.J. EL-SAYED	TERAS A&M
TM - H.R. GORDON	NOAA-PHEL
TM - R.C. WRIGLEY	NASA-ARC
TM - F.P. ANDERSON	NATL RES INST OCEANOOL
TM - R. AUSTIN	SCRIPPS INST OCEANOGR

BRIEF DESCRIPTION

THE COASTAL ZONE COLOR SCANNER EXPERIMENT WAS DESIGNED TO MAP CHLOROPHYLL CONCENTRATION IN WATER, SEDIMENT DISTRIBUTION, GELBstoffe CONCENTRATIONS AS A SALINITY INDICATOR, AND TEMPERATURE OF COASTAL WATERS AND OCEAN CURRENTS. REFLECTED SOLAR ENERGY WAS MEASURED IN SIX CHANNELS TO SENSE COLOR CAUSED BY ABSORPTION DUE TO CHLOROPHYLL, SEDIMENTS, AND GELBstoffe IN COASTAL WATERS. SPECTRAL BANDS AT 443 AND 670 NANOMETERS CENTER ON THE MOST INTENSE ABSORPTION BANDS OF CHLOROPHYLL, WHILE THE BAND AT 550 NANOMETERS CENTERS ON THE 'HINGE POINT,' THE WAVELENGTH OF MINIMUM ABSORPTION. RATIOS OF MEASURED ENERGIES IN THESE CHANNELS WERE SHOWN TO CLOSELY PARALLEL SURFACE CHLOROPHYLL CONCENTRATIONS. DATA FROM THE SCANNING RADIOMETER WERE PROCESSED, WITH ALGORITHMS DEVELOPED FROM THE FIELD EXPERIMENT DATA, TO PRODUCE MAPS OF CHLOROPHYLL ABSORPTION. THE TEMPERATURE OF COASTAL WATERS AND OCEAN CURRENTS WAS MEASURED IN A SPECTRAL BAND CENTERED AT 11.5 MICRORAMETERS. OBSERVATIONS WERE ALSO MADE IN TWO OTHER SPECTRAL BANDS, THE FIRST AT 520 NANOMETERS FOR CHLOROPHYLL CORRELATION AND 750 NANOMETERS FOR SURFACE VEGETATION. TO AVOID SUN GLINT, THE SCANNER MIRROR COULD BE TILTED ABOUT THE SENSOR PITCH AXIS ON COMMAND SO THAT THE LINE OF SIGHT OF THE SENSOR WAS MOVED PLUS OR MINUS 0.35 RAD IN STEPS OF 0.035 RAD WITH RESPECT TO NADIR.

----- NIMBUS 7, JACOBOWITZ -----

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 78-098A-07

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

TL - H. JACOBOWITZ	NOAA-NESS
TM - T.H. VONDERHAAR	COLORADO STATE U
TM - F.B. HOUSE	DREXEL INST OF TECH
TM - K.L. COULSON	U OF CALIF, DAVIS
TM - J.R. HICKNEY	EPPLEY LAB, INC
TM - L.L. STONE	NOAA-NESS
TM - A.P. INGERSOLL	CALIF INST OF TECH
TM - G.L. SMITH	NASA-LARC

BRIEF DESCRIPTION

THE OBJECTIVE OF THE EARTH RADIATION BUDGET (ERB) EXPERIMENT, A CONTINUATION OF NIMBUS 6 ERB, WAS TO DETERMINE, OVER A PERIOD OF A YEAR, THE EARTH RADIATION BUDGET ON BOTH SYNOPTIC AND PLANETARY SCALES BY SIMULTANEOUS MEASUREMENT OF INCOMING SOLAR RADIATION AND OUTGOING EARTH REFLECTED (SHORTWAVE) AND EMITTED (LONGWAVE) RADIATION. BOTH FIXED WIDE-ANGLE SAMPLING OF TERRESTRIAL FLUXES AT THE SATELLITE ALTITUDE AND SCANNED NARROW-ANGLE SAMPLING OF THE RADIANCE COMPONENTS DEPENDENT ON ANGLE WERE USED TO DETERMINE OUTGOING RADIATION (REFLECTED AND EMITTED). THE ERB SUBSYSTEM CONSISTED OF A 22-CHANNEL RADIOMETER CONTAINING SEPARATE SUBASSEMBLIES TO PERFORM THE REQUIRED SOLAR, EARTH-FLUX (WIDE ANGLE), AND SCANNED EARTH RADIANCE (NARROW ANGLE) MEASUREMENTS. THE SYSTEMS USED OPTICAL FILTERS FOR SPECTRAL DISCRIMINATIONS, AS WELL AS UNCOOLED THERMAL DETECTORS, THERMOPILE DETECTORS IN THE SOLAR AND FIXED-EARTH-FLUX CHANNELS, AND PYROELECTRIC DETECTORS IN THE SCANNING CHANNELS. THE 10 SOLAR CHANNELS VIEWED IN FRONT OF THE OBSERVATORY IN THE X-Y PLANE. THE SOLAR CHANNELS OBTAINED USABLE SOLAR DATA ONLY DURING A PERIOD OF ABOUT 3 MIN IN EACH ORBIT WHEN THE SPACECRAFT WAS OVER THE ANTARCTIC REGION. THEIR FULL RESPONSE FIELD OF VIEW (FOV) WAS 0.18 RAD. THE SOLAR CHANNEL SUBASSEMBLY WAS PIVOTED PLUS OR MINUS 0.35 RAD IN THE X-Y PLANE TO COMPENSATE FOR SUN ANGLE DEVIATION WHEN REQUIRED. THE FOUR EARTH-FLUX CHANNELS WERE MOUNTED SO THEY CAN CONTINUOUSLY VIEW THE TOTAL EARTH DISK AND WERE CONTINUOUSLY SAMPLED AT FOUR PER S. DEMODULATOR OUTPUT SIGNALS WERE INTEGRATED FOR PERIODS OF AT LEAST 3.8 S. THERE WERE EIGHT NARROW FOV CHANNELS (FOUR SHORTWAVE AND FOUR LONGWAVE) MOUNTED IN THE SCANNING HEAD. THE HEAD WAS GIMBAL MOUNTED IN THE RADIOMETER UNIT MAIN FRAME. THE FOV OF THE TELESCOPES WERE ASYMMETRIC (4.4 BY 89.4 MRAD) AND THE FOV OF THE SHORTWAVE AND LONGWAVE CHANNELS WERE COINCIDENT. THE 89.4 MRAD FOV OF THE

FOUR PAIR OF CHANNELS WAS NOT CONTIGUOUS, BUT COVERED ONLY ALTERNATE 89.4 MRAD ANGULAR INTERVALS ALONG THE HORIZON.

----- NIMBUS 7, MCCORMICK -----

INVESTIGATION NAME- STRATOSPHERIC AEROSOL MEASUREMENT-II  
(SAM-II)

NSSDC ID- 78-098A-06

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
UPPER ATMOSPHERE RESEARCH  
METEOROLOGY

PERSONNEL

TL - R.P. MCCORMICK	NASA-LARC
TM - T.J. PEPIN	U OF WYOMING
TM - G.W. GRAMS	GEORGIA INST OF TECH
TM - B.M. HERMAN	U OF ARIZONA
TM - P.B. RUSSELL	SRI INTERNATIONAL

BRIEF DESCRIPTION

THE OBJECTIVE OF SAM-II WAS TO MAP THE CONCENTRATION AND OPTICAL PROPERTIES OF STRATOSPHERIC AEROSOLS AS A FUNCTION OF ALTITUDE, LATITUDE, AND LONGITUDE. WHEN NO CLOUDS WERE PRESENT IN THE INSTRUMENT FIELD OF VIEW (IFOV), THE TROPOSPHERIC AEROSOLS COULD ALSO BE MAPPED. THE INSTRUMENT, BASICALLY A SUN PHOTOMETER, MEASURED THE EXTINCTION OF SOLAR RADIATION AT 1.0-MICRORAMETER WAVELENGTH DURING SPACECRAFT SUNRISE AND SUNSET. THE PHOTOMETER VIEWED A PORTION OF THE SOLAR DISK WITH A 0.145-MRAD IFOV AND A SAMPLING RATE OF 50 SAMPLES PER SECOND. AS THE SPACECRAFT FIRST VIEWED THE SUNRISE, THE PHOTOMETER-POINTING AXIS WAS DEPRESSED APPROXIMATELY 0.52 RAD WITH RESPECT TO THE SPACECRAFT HORIZONTAL. THE PHOTOMETER CONTINUED LOOKING AT THE SUN UNTIL ITS DEPRESSION ANGLE WAS ON THE ORDER OF 0.64 RAD (APPROXIMATELY 1.4 MIN OBSERVING TIME). BEFORE SUNSET, THE PHOTOMETER HEAD ROTATED 5.14 RAD IN AZIMUTH AND VIEWED THE SUN FROM A DEPRESSION OF APPROXIMATELY 0.49 TO 0.52 RAD AS THE SPACECRAFT ORBITED TO THE DARK SIDE OF THE EARTH. FOR THE EXPECTED HIGH NOON ORBIT, LATITUDES OF BETWEEN 1.12 AND 1.40 RAD IN BOTH HEMISPHERES WERE SCANNED FOR 3 MONTHS. THE EXTINCTION MEASUREMENTS WERE INVERTED FOR THE NUMBER-DENSITY TIMES THE AEROSOL SCATTERING CROSS SECTION BY USING THE LAMBERT-BEER LAW AND ASSURING THE ATMOSPHERE TO BE COMPOSED OF LAYERS. TO DETERMINE THE STRATOSPHERIC AEROSOL OPTICAL PROPERTIES, GROUND-TRUTH IN SITU BALLOON-BORNE AEROSOL MEASUREMENTS WERE ALSO MADE.

\*\*\*\*\* NOAA 6 \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA 6  
ALTERNATE NAMES- NOAA-A, 11416

NSSDC ID- 79-057A

LAUNCH DATE- 06/27/79

WEIGHT- 588.9 KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY  
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTP	EPOCH DATE- 06/28/79
ORBIT PERIOD- 101.5 MIN	INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT	APOAPSIS- 835. KM ALT

PERSONNEL  
MG - R. ARNOLD  
PR - J. FULLER, JR.

NASA HEADQUARTERS  
NASA-GSFC

BRIEF DESCRIPTION

NOAA 6, A TIROS-N TYPE SPACECRAFT, WAS THE FIRST IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (CARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDED AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDED AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSISTED OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURED THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSED AND RELAYED TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE WAS BASED UPON THE BLOCK 5D SPACECRAFT (DMSP-F1 OR 78-091A) BUS DEVELOPED FOR THE US AIR FORCE, AND WAS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S.

----- NOAA 6: NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER  
(AVHRR)

NSSDC ID- 79-057A-01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE NOAA 6 ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) WAS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA WERE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATED IN THE SCANNING MODE AND MEASURED Emitted AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRUMETER, CHANNEL 2 (NEAR IR), 0.725 MICRUMETER TO DETECTOR CUT OFF AROUND 1.3 MICRUMETERS, CHANNEL 3 (IR WINDOW), 10.5 TO 13.5 MICRUMETERS, AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.93 MICRUMETERS. ALL FOUR CHANNELS HAD A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAD A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR WAS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA WERE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD WERE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDED GLOBAL AREA COVERAGE (GAC) DATA, HAD A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINED DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS WERE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA 6: NESS STAFF -----

INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER

NSSDC ID- 79-057A-02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE NOAA 6 OPERATIONAL SOUNDER CONSISTED OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAD 14 CHANNELS AND MADE MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS: CHANNEL 1 - THE 3.7-MICRUMETER WINDOW REGION, CHANNEL 2 - THE 4.3-MICRUMETER CO<sub>2</sub> BAND, CHANNEL 3 - THE 9.7-MICRUMETER OZONE BAND, CHANNEL 4 - THE 11.1-MICRUMETER WINDOW REGION, CHANNELS 5 THROUGH 11 - THE 15-MICRUMETER CO<sub>2</sub> BAND (15.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 14 - THE 18-MICRUMETER ROTATIONAL WATER VAPOR BANDS (18.8, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAD THREE CHANNELS OPERATING AT 14.97 MICRUMETERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE MODULATED CELLS CONTAINING CO<sub>2</sub>. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDER UNIT, HAD FOUR CHANNELS OPERATING IN THE 50 TO 60 GHZ OXYGEN BAND (50.5, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH WERE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS WERE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDED SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS WERE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA 6: NESS STAFF -----

INVESTIGATION NAME- DATA COLLECTION SYSTEM

NSSDC ID- 79-057A-03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA 6 WAS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVED LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS WERE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT CAME IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL WAS

OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS WAS EXPECTED, FOR A ROVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF ± 5 TO 10 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAD THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS WERE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA 6: WILLIAMS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- 79-057A-04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
CI - R. SEALE

NOAA-ERL  
NOAA-ERL

BRIEF DESCRIPTION

THIS EXPERIMENT WAS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE ITOS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTED OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURED IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 60 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/W AND 25 MEV/W. THERE WERE TWO LEPATs VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURED PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAD A 50-DEG VIEWING CONE, VIEW IN THE ANTI-EARTH DIRECTION, AND IT MEASURED PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/W. THE TOTAL ENERGY DETECTOR (TED) MEASURED TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOAA-B \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA-B  
ALTERNATE NAMES- 11819

NSSDC ID- 80-043A

LAUNCH DATE- 05/29/80  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY  
UNITED STATES  
UNITED STATES

NOAA-NESS  
NASA-OSTA

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 102.2 MIN  
PERIASTRIS- 273. KM ALT

EPOCH DATE- 05/30/80  
INCLINATION- 92.3 DEG  
APOAPSIS- 1453. KM ALT

PERSONNEL  
MG - R.L. GARBACZ  
PM - G.A. BRANCHFLOWER  
PS - A. ABKING

HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
NOAA-B IS THE SECOND IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDES AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDE AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOUR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSIST OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSES AND RELAYS TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE IS BASED UPON THE BLOCK 5D SPACECRAFT BUS DEVELOPED FOR THE US AIR FORCE, AND IS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S. DUE TO A MALFUNCTION IN THE LAUNCH VEHICLE, NOAA-B DID NOT ACHIEVE THE PROPER ORBIT.

----- NOAA-B: NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER  
(AVHRR)

NSSDC ID- 80-043A-01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE NOAA-B ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) IS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA ARE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATES IN THE SCANNING MODE AND MEASURES EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRONESTER, CHANNEL 2 (NEAR IR), 0.725 MICRONESTER TO DETECTOR CUT OFF AROUND 1.5 MICRONESTERS; CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRONESTERS; AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.93 MICRONESTERS. ALL FOUR CHANNELS HAVE A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAVE A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR IS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA ARE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APPT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD ARE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDE GLOBAL AREA COVERAGE (GAC) DATA, WHICH HAVE A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINS DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS ARE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

**----- NOAA-B, NESS STAFF -----****INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER**

NSSDC ID- 80-043A-02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBSINVESTIGATION DISCIPLINE(S)  
METEOROLOGY**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE NOAA-B OPERATIONAL SOUNDER CONSISTS OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 10 KM). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAS 24 CHANNELS AND MAKES MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 - THE 3.7-MICRONESTER WINDOW REGION; CHANNEL 2 - THE 4.3-MICRONESTER CO2 BAND; CHANNEL 3 - THE 9.7-MICRONESTER OZONE BAND; CHANNEL 4 - THE 11.3-MICRONESTER WINDOW REGION; CHANNELS 5 THROUGH 11 - THE 15-MICRONESTER CO2 BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0); AND CHANNELS 12 THROUGH 14 - THE 18-MICRONESTER ROTATIONAL WATER VAPOR BANDS (18.6, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAS THREE CHANNELS OPERATING AT 14.97 MICRONESTERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE MODULATED CELLS CONTAINING CO2. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAS FOUR CHANNELS OPERATING IN THE 50 TO 60 GHZ OXYGEN BAND (50.3, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS ARE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

**----- NOAA-B, NESS STAFF -----****INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)**

NSSDC ID- 80-043A-03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBSINVESTIGATION DISCIPLINE(S)  
METEOROLOGY**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA-B IS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVES LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CADA) STATION, FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

**----- NOAA-B, WILLIAMS -----****INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR**

NSSDC ID- 80-043A-04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORINGINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS**PERSONNEL**PI - D.J. WILLIAMS  
OI - H.H. SAUER  
OI - C.O. BOSTROMNOAA-ERL  
NOAA-ERL  
APPLIED PHYSICS LAB**BRIEF DESCRIPTION**

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE TIROS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 40 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 25 MEV/N. THERE ARE TWO LEPAUT VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 700 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEW IN THE ANTI-EARTH DIRECTION, AND IT MEASURES PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 2 KEV.

----- DAO 3 -----

SPACECRAFT COMMON NAME- DAO 3  
ALTERNATE NAMES- PL-7010, DAO-C  
COPERNICUS, 96153

NSSDC ID- 72-065A

LAUNCH DATE- 08/21/72  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- ATLASSPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSINITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEODETIC  
ORBIT PERIOD- 99.7 MIN  
PERIAPSIS- 739. KM ALT  
EPOCH DATE- 08/21/72  
INCLINATION- 35.0 DEG  
APOAPSIS- 751. KM ALTPERSONNEL  
MG - R.E. McDONALD  
SC - E.J. WEILER  
PM - J.P. CORRIGAN  
PS - J.E. KUPPERIAN, JR.NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

**BRIEF DESCRIPTION**  
 THIS MISSION WAS THE THIRD IN THE DAO PROGRAM AND ITS SECOND SUCCESSFUL SPACECRAFT TO OBSERVE THE CELESTIAL SPHERE FROM ABOVE THE EARTH'S ATMOSPHERE. A UV TELESCOPE WITH A SPECTROMETER MEASURED HIGH-RESOLUTION SPECTRA OF STARS, GALAXIES, AND PLANETS WITH THE MAIN EMPHASIS ON THE DETERMINATION OF INTERSTELLAR ABSORPTION LINES. THREE X-RAY TELESCOPES AND A COLLIMATED, PROPORTIONAL COUNTER PROVIDED MEASUREMENTS OF COSMIC X-RAY SOURCES AND INTERSTELLAR ABSORPTION BETWEEN .1 AND 7 NM. THE DAO-3 SPACECRAFT WAS AN OCTAGONALLY-SHAPED, ALUMINUM STRUCTURE WITH A 1.21-M HOLLOW, CENTRAL, TUBULAR AREA, WHICH HOUSED THE EXPERIMENT CONTAINER. SOLAR PANELS WERE MOUNTED ON EACH SIDE OF THE SPACECRAFT AT ANGLES OF 36 DEG AND HAD AN AREA OF 38.2 SQ M. A SUN Baffle PROTECTED THE EXPERIMENTS AND INCREASED THE LENGTH OF THE SPACECRAFT TO 4.9 M. TWO INERTIAL BALANCE DOORS, ONE FORWARD AND ONE AFT, EXTENDED APPROXIMATELY 6.0 M. THE SPACECRAFT WAS EQUIPPED WITH AN INTERNAL REFERENCE UNIT (A HIGH-PRECISION, THREE-AXIS GYRO INERTIAL SYSTEM), SUN SENSORS, A MAGNETOMETER, AND STAR TRACKERS, WHICH ENABLED SPACECRAFT POINTING TO BE DETERMINED IN MANY DIFFERENT WAYS. A BORESIGHT STAR TRACKER, SENSITIVE TO SIXTH MAGNITUDE, CONTROLLED PITCH AND YAW TO WITHIN 5 ARC S. IN ADDITION, THE HIGH-RESOLUTION TELESCOPE EXPERIMENT HAD A FINE POINTING CONTROL, WHICH COULD CONTROL THE PITCH AND YAW TO WITHIN ONE TENTH ARC S ON BRIGHT STARS. SPACECRAFT ATTITUDE WAS CONTROLLED BY INERTIA WHEELS AND THRUSTERS. REDUNDANT TRACKING BEACONS FACILITATED GROUND TRACKING OF THE SPACECRAFT. TWO UHF (400.55 MHZ) TRANSMITTERS PROVIDED WIDEBAND TELEMETRY FOR TRANSMITTING DIGITAL DATA TO THE GROUND STATIONS. TWO REDUNDANT VHF (134.26 MHZ) TRANSMITTERS WERE USED IN A NARROW-BAND TELEMETRY LINK USED PRIMARILY FOR TRANSMITTING SPACECRAFT HOUSEKEEPING DATA, ALTHOUGH THEY SERVED AS BACKUPS FOR THE WIDEBAND TELEMETRY SYSTEM. TWO REDUNDANT PAIRS OF VHF COMMAND RECEIVERS WERE CARRIED AS PART OF A COMMAND SYSTEM CAPABLE OF STORING 3200 COMMANDS. DATA WERE STORED ON AN ON-BOARD TAPE RECORDER AND IN CORE STORAGE. AN ON-BOARD PROCESSOR MONITORED TELEMETRY DATA, ISSUED COMMANDS, AND WAS PROGRAMMED VIA THE COMMAND RECEIVER UPLINK. GUEST INVESTIGATORS AND THEIR INVESTIGATIONS ARE LISTED IN APPENDIX B.

ORIGINAL PAGE IS  
POOR QUALITY

----- DAO 3, BOYD -----

INVESTIGATION NAME- STELLAR X-RAYS

NSSDC ID- 72-065A-02 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - R.L.F. BOYD  
OI - P.W. SANFORD

U COLLEGE LONDON  
U COLLEGE LONDON

BRIEF DESCRIPTION

THIS EXPERIMENT USED THREE TELESCOPES AND A COLLIMATED PROPORTIONAL COUNTER TO OBSERVE COSMIC X-RAY SOURCES BETWEEN .01 AND 7 NM. BETWEEN .1 AND .3 NM, A PROPORTIONAL COUNTER LOCATED BEHIND A COLLIMATOR WAS USED IN CONJUNCTION WITH PULSE-SHAPE DISCRIMINATION TO REJECT BACKGROUND COUNTS. FROM .3 TO .9 NM AND .6 TO 1.8 NM, PROPORTIONAL COUNTERS LOCATED AT THE FOCUS OF TWO GRAZING-INCIDENCE REFLECTING TELESCOPES (.5-.8 SQ CM AND 12 SQ CM, RESPECTIVELY) WERE USED. WITH AN ANTICOINCIDENCE SCINTILLATOR ALSO EMPLOYED TO REJECT BACKGROUND COSMIC-RAY COUNTS. AN OPEN-CHANNEL MULTIPLIER LOCATED AT THE FOCUS OF A GRAZING-INCIDENCE TELESCOPE (23 SQ CM) WAS USED TO OBSERVE BETWEEN 2 AND 7 NM. DATA FROM THIS EXPERIMENT WERE USED TO DETERMINE THE INTERSTELLAR ABSORPTION OF SOFT X-RAYS.

----- DAO 3, SPITZER -----

INVESTIGATION NAME- HIGH-RESOLUTION TELESCOPES

NSSDC ID- 72-065A-01 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - L. SPITZER  
OI - J. ROBERTSON, JR.

PRINCETON U  
PRINCETON U

BRIEF DESCRIPTION

THE PRIMARY OBJECTIVE OF THIS EXPERIMENT WAS TO MAKE QUANTITATIVE OBSERVATIONS OF INTERSTELLAR ABSORPTION LINES IN THE SPECTRAL REGION 100 TO 330 NM. THE SECONDARY OBJECTIVE WAS TO OBSERVE UV SPECTRA OF SELECTED BRIGHTEST STARS. THE PRIME OPTICAL SYSTEM WAS AN 80-CM-DIAF CASSIAGRAN TELESCOPE WITH A 16-M FOCAL LENGTH (F/28). THIS TELESCOPE WAS COUPLED TO A PASCHEN-RUNGE SPECTROMETER CAPABLE OF 0.1-A RESOLUTION IN FIRST ORDER AND 0.05-A RESOLUTION IN SECOND ORDER. THE PHOTONS WERE DETECTED BY FOUR EMR PHOTOTUBES, EACH EQUIPPED WITH ITS OWN EXIT SLIT, AND MOVABLE IN PAIRS ALONG THE ROWLAND CIRCLE. A GUIDANCE ERROR SENSOR ATTACHED TO THE PRIME OPTICS CONTROLLED THE SPACECRAFT ATTITUDE TO WITHIN 0.1 ARC S. THIS GUIDANCE SYSTEM LOCKED ONTO A STAR AS FAINT AS 7TH MAGNITUDE. THE OVERALL SYSTEM COULD MAKE USEFUL MEASUREMENTS ON O- AND B-TYPE STARS TO 7TH MAGNITUDE.

----- PIONEER 6-----

SPACECRAFT COMMON NAME- PIONEER 6  
ALTERNATE NAMES- PIONEER-A, 01843

NSSDC ID- 65-105A

LAUNCH DATE- 12/16/65 WEIGHT- 146. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-CSS

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- 311.1 DAYS  
PERIAPSIS- 0.813 AU RAD

EPOCH DATE- 07/12/75  
INCLINATION- 0.168 DEG  
APOAPSIS- 0.983 AU RAD

PERSONNEL

PI - F.D. KOCHENDORFER  
SC - A.G. OPP  
PM - C.F. HALL  
PS - J.H. WOLFE

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-ARC  
NASA-ARC

MASS INST OF TECH  
MASS INST OF TECH  
U OF WISCONSIN

BRIEF DESCRIPTION

PIONEER 6 WAS THE FIRST IN A SERIES OF SOLAR-ORBITING, SPIN-STABILIZED, SOLAR-CELL AND BATTERY-POWERED SATELLITES DESIGNED TO OBTAIN MEASUREMENTS ON A CONTINUING BASIS OF INTERPLANETARY PHENOMENA FROM WIDELY SEPARATED POINTS IN SPACE. ITS EXPERIMENTS STUDIED THE POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND, THE INTERPLANETARY ELECTRON DENSITY (RADIO PROPAGATION EXPERIMENT), SOLAR AND GALACTIC COSMIC RAYS, AND THE INTERPLANETARY MAGNETIC FIELD. ITS MAIN ANTENNA WAS A HIGH-GAIN, DIRECTIONAL ANTENNA. THE SPACECRAFT WAS SPIN-STABILIZED AT ABOUT 60 RPM, AND THE SPIN AXIS WAS PERPENDICULAR TO THE ECLIPTIC PLANE AND POINTED TOWARD THE SOUTH ECLIPTIC POLE. BY GROUND COMMAND, ONE OF FIVE BIT RATES, ONE OF FOUR DATA FORMATS, AND ONE OF FOUR OPERATING MODES COULD BE SELECTED. THE FIVE BIT RATES WERE 512, 256, 64, 16, AND 8 DPS. THREE OF THE FOUR DATA FORMATS CONTAINED PRIMARILY SCIENTIFIC DATA AND CONSISTED OF 32 SEVEN-BIT WORDS PER FRAME. ONE SCIENTIFIC DATA FORMAT WAS FOR USE AT THE TWO HIGHEST BIT

RATES. ANOTHER WAS FOR USE AT THE THREE LOWEST BIT RATES. THE THIRD CONTAINED DATA FROM ONLY THE RADIO PROPAGATION EXPERIMENT. THE FOURTH DATA FORMAT CONTAINED MAINLY ENGINEERING DATA. THE FOUR OPERATING MODES WERE REAL TIME, TELEMETRY STORE, DUTY CYCLE STORE, AND MEMORY READOUT. IN THE REAL-TIME MODE, DATA WERE SAMPLED AND TRANSMITTED DIRECTLY (WITHOUT STORAGE) AS SPECIFIED BY THE DATA FORMAT AND BIT RATE SELECTED. IN THE TELEMETRY STORE MODE, DATA WERE STORED AND TRANSMITTED SIMULTANEOUSLY IN THE FORMAT AND AT THE BIT RATE SELECTED. IN THE DUTY CYCLE STORE MODE, A SINGLE FRAME OF SCIENTIFIC DATA WAS COLLECTED AND STORED AT A RATE OF 512 DPS. THE TIME INTERVAL BETWEEN THE COLLECTION AND STORAGE OF SUCCESSIVE FRAMES COULD BE VARIED BY GROUND COMMAND BETWEEN 2 AND 17 MIN TO PROVIDE PARTIAL DATA COVERAGE FOR PERIODS UP TO 19 H, AS LIMITED BY THE BIT STORAGE CAPACITY. IN THE MEMORY READOUT MODE, DATA WERE READ OUT AT WHATEVER BIT RATE WAS APPROPRIATE TO THE SATELLITE DISTANCE FROM THE EARTH.

----- PIONEER 6, ANDERSON -----

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 65-105A-07 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
CELESTIAL MECHANICS

PERSONNEL

PI - J.D. ANDERSON

NASA-JPL

BRIEF DESCRIPTION

THE PURPOSE OF THIS EXPERIMENT WAS TO USE THE TRACKING DATA FROM THE MISSION TO OBTAIN PRIMARY DETERMINATIONS OF THE MASSES OF THE EARTH AND MOON, THE ASTRONOMICAL UNIT, AND THE OSCILLATING ELEMENTS OF THE ORBIT OF THE EARTH. THIS WAS APPROPRIATE BECAUSE OF THE ABSENCE OF MIDCOURSE ORBIT CORRECTIONS AND NEAR-PLANETARY ENCOUNTERS. ALSO, SOLAR RADIATION PRESSURE EFFECTS WERE SMALL. THE EXPERIMENT USED THE ONBOARD RECEIVER AND TRANSMITTER EQUIPMENT IN CONJUNCTION WITH DEEP SPACE NETWORK STATION EQUIPMENT TO OBTAIN DOPPLER MEASUREMENTS.

----- PIONEER 6, ANDERSON -----

INVESTIGATION NAME- RELATIVITY INVESTIGATION

NSSDC ID- 65-105A-10 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - J.D. ANDERSON

NASA-JPL

BRIEF DESCRIPTION

THE PIONEER 6 SPACECRAFT PRESENTED THE FIRST OPPORTUNITY TO INVESTIGATE THE RELATIVISTIC CONTRIBUTION OF THE SUN TO THE DOPPLER SHIFTING OF THE SPACECRAFT TRANSMITTER SIGNAL. THE DOPPLER TRANSFONDER SEGMENT OF THE SPACECRAFT TRANSMITTER WAS TO BE USED FOR THIS PURPOSE. HOWEVER, THE CORONAL NOISE PRODUCED A MUCH LARGER CONTRIBUTION TO THE TRANSMITTER SIGNAL THAN DID THE RELATIVISTIC DOPPLER EFFECT. THUS, ALTHOUGH THE EXPERIMENT FAILED IN ITS PRIMARY PURPOSE, IT DID CONTRIBUTE THE FIRST MEASURE OF THE RELATIVE EFFECT OF CORONAL NOISE ON DOPPLER SHIFTING OF RADIO SIGNALS.

----- PIONEER 6, BRIDGE -----

INVESTIGATION NAME- SOLAR WIND PLASMA FARADAY CUP

NSSDC ID- 65-105A-02 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - H.S. BRIDGE  
OI - A.J. LAZARUS  
OI - F. SCHERB

MASS INST OF TECH  
MASS INST OF TECH  
U OF WISCONSIN

BRIEF DESCRIPTION

A MULTIGRID FARADAY CUP WITH TWO SEMICIRCULAR, COPLANAR COLLECTORS WAS USED TO STUDY SOLAR WIND IONS AND ELECTRONS. THE INSTRUMENT HAD 16 CONTIGUOUS ENERGY-PER-CHARGE (E/P) CHANNELS BETWEEN .75 AND 9485 V FOR POSITIVE IONS AND FOUR ENERGY-PER-CHARGE CHANNELS BETWEEN 90 AND 1560 V FOR ELECTRONS. THE INSTRUMENT VIEW AXIS WAS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS AND PARALLEL TO THE ECLIPTIC PLANE. THE LINE SEPARATING THE TWO COLLECTORS LAY IN THE ECLIPTIC PLANE, ENABLING A ROUGH DETERMINATION OF SOLAR WIND BULK FLOW PERPENDICULAR TO THE ECLIPTIC PLANE. DURING EVERY SECOND SPACECRAFT ROTATION AND AT ONE VOLTAGE LEVEL, THE SUM OF THE CURRENTS FROM THE COLLECTORS WAS OBTAINED IN 28 CONTIGUOUS 11.25-DEG ANGULAR SECTORS (FROM -45 DEG TO 270 DEG, WITH 0 DEG BEING THE SPACECRAFT-SUN LINE). THE EIGHT MEASUREMENTS ABOUT THE SUN-EARTH LINE (-45 DEG TO +45 DEG) WERE TELEMETRED, BUT ONLY THE LARGEST MEASUREMENT IN EACH SUCCEEDING 45-DEG INTERVAL (+45 DEG TO 270 DEG) WAS TELEMETRED. IN ADDITION, DURING THIS ROTATION, THE CURRENT FROM ONE OF THE COLLECTORS WAS MEASURED IN ALL TWENTY-EIGHT 11.25-DEG SECTORS, AND THE LARGEST WAS

IDENTIFIED AND TELEMETERED (WITH MAGNITUDE AND SECTOR). A COMPLETE SET OF POSITIVE ION MEASUREMENTS AND ONE ENERGY CHANNEL OF ELECTRON MEASUREMENTS WERE COMPLETED EVERY 32 SEC. THE TIME BETWEEN EACH 32-S GROUP OF MEASUREMENTS VARIED WITH THE BIT RATE. FOR A MORE COMPLETE DESCRIPTION, SEE "J. GEOPHYS. RES.", VOL 71, 3787-3791, AUGUST 1966.

----- PIONEER 6: FAN -----

INVESTIGATION NAME- COSMIC-RAY TELESCOPE

NSSDC ID- 65-105A-03 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - E.V. FAN U OF ARIZONA  
OJ - J.A. SIMPSON U OF CHICAGO  
OJ - J.C. LAMPORT U OF CHICAGO

BRIEF DESCRIPTION

THIS EXPERIMENT USED A CHARGED PARTICLE TELESCOPE COMPOSED OF FOUR SILICON SOLID-STATE DETECTORS TO STUDY THE ANISOTROPY AND FLUCTUATIONS OF SOLAR PROTONS AND ALPHA PARTICLES. THE PROTON ENERGY RANGES SAMPLED WERE 0.6 TO 13.9 MEV, 13.9 TO 73.2 MEV, 73.2 TO 178 MEV, AND E.GT. 178 MEV. THE ALPHA PARTICLE ENERGY RANGES SAMPLED WERE 2.4 TO 55.6 MEV, 55.6 TO 293 MEV, AND E.GT. 293 MEV. THE TIME RESOLUTION VARIED FROM ABOUT ONE MEASUREMENT PER 0.4 S TO ABOUT ONE MEASUREMENT PER 20 S DEPENDING ON THE TELEMETRY BIT RATE. THE DETECTOR WAS MOUNTED SO THAT IT MADE A 360-DEG SCAN IN THE ECLIPSTIC PLANE ABOUT ONCE PER SECOND. PULSE HEIGHT ANALYSIS OF DETECTOR D1 OUTPUT (128 CHANNEL) AND D3 OUTPUT (52 CHANNEL) WAS ACCOMPLISHED FOR THE LAST EVENT PRIOR TO EACH TELEMETRY READOUT FOR THE EXPERIMENT. FOR FURTHER DETAILS, SEE FAN ET AL., JGR, 73, 1959, 1968.

----- PIONEER 6: GOLDSTEIN -----

INVESTIGATION NAME- SPECTRAL BROADENING

NSSDC ID- 65-105A-09 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
HIGH ENERGY ASTROPHYSICS  
SOLAR PHYSICS

PERSONNEL

PI - R.M. GOLDSTEIN NASA-JPL

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT WAS TO EXPLORE THE STRUCTURE OF THE CORONA AND SOLAR EVENTS BY USING TELEMETRY SIGNALS AND THEIR SPECTRAL LINE BROADENING AS THEY PASSED THROUGH THE SOLAR CORONA AND APPROACHED THE SUN'S LIMB DURING SUPERIOR CONJUNCTION OCCULTATION. NORMALLY THE SIGNALS CONSISTED OF VERY NARROW-BAND (MONOCHROMATIC) AND SPECTRALLY PURE CARRIER WAVES AND A SET OF MODULATION SIDE BANDS. THE CARRIER WAVE FREQUENCY WAS NOMINALLY 2295 Hz AND THE SIDE BANDS WERE SEPARATED BY MULTIPLES OF 2 kHz AND WERE REMOVED BY FILTERING. DATA WERE COLLECTED IN THE FORM OF SPECTROGRAMS, EACH CONSISTING OF A 15-MIN OBSERVATION. THE THREE PARAMETERS OF INTEREST WERE THE SIGNAL POWER, CENTER FREQUENCY, AND BANDWIDTH. THE INSTRUMENTATION CONSISTED OF THE SPACECRAFT S-BAND TELEMETRY SYSTEM AND JPL'S 64-m RECEIVER ANTENNA, WHICH HAD A BEAMWIDTH OF ONLY 0.14 DEG AT 2300 MHz (S-BAND). IT WAS EXTREMELY SENSITIVE, HAVING AN EQUIVALENT NOISE TEMPERATURE OF ONLY 25 DEG K. THE RECEIVER WAS TUNED CONTINUOUSLY ACCORDING TO AN EPHEMERIS, WITH AN ACCURACY TO 0.05 Hz. THIS WAS NECESSARY IN ORDER TO COMPENSATE FOR FREQUENCY SHIFTS RESULTING FROM ORBITAL VELOCITIES OF THE SPACECRAFT AND EARTH'S SPIN. THE FREQUENCY BANDWIDTH WAS 300 Hz FOR EACH SPECTRUM, DEFINED BY A FILTER AT THE LAST STAGE OF THE RECEIVER. FREQUENCY RESOLUTION WAS 0.2 Hz OVER THE 100-Hz BANDWIDTH.

----- PIONEER 6: MCCRACKEN -----

INVESTIGATION NAME- COSMIC-RAY ANISOTROPY

NSSDC ID- 65-105A-05 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - K.G. MCCRACKEN CSIRO  
OJ - W.C. BARTLEY NATL ACADEMY OF SCI  
OJ - U.B. RAO ISRO SATELLITE CENTER

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED PRIMARILY TO MEASURE THE DIRECTIONAL CHARACTERISTICS OF GALACTIC AND SOLAR COSMIC-RAY FLUXES. THE PARTICLE DETECTOR WAS A CsI (Tl) SCINTILLATOR CRYSTAL THAT WAS SET INTO AN ANTCOINCIDENCE PLASTIC SCINTILLATOR COLLIMATOR CUP. SEPARATE PHOTOMULTIPLIER TUBES VIEWED THE TWO SCINTILLATORS. PULSES FROM THE CsI CRYSTAL UNACCOMPANIED BY PULSES FROM THE PLASTIC SCINTILLATOR WERE SORTED BY A THREE-WINDOW PULSE HEIGHT ANALYZER. THE WINDOWS

CORRESPONDING TO ENERGY DEPOSITIONS OF 7.4 TO 40.0, 40.0 TO 77.1, AND 77.1 TO 363.6 MEV. COUNTS IN THE TWO LOWER ENERGY WINDOWS WERE DUE MAINLY TO PROTONS WITH THE WINDOW ENERGIES, WHILE ONLY PARTICLES OF Z GREATER THAN OR EQUAL TO 2 CONTRIBUTED TO THE HIGHEST ENERGY WINDOW COUNT RATE. (PROTONS ABOVE 90 MEV GAVE ANTICOINCIDENCE PULSES.) FOR EACH ENERGY WINDOW, COUNTS WERE SEPARATELY ACCUMULATED IN EACH OF FOUR ANGULAR SECTORS AS THE SPACECRAFT SPUN. EACH ANGULAR SECTOR WAS NORMALLY 89.5 DEG IN WIDTH, WITH THE SUN IN THE MIDDLE OF ONE SECTOR. HOWEVER, WHEN LARGE FLUXES WERE ENCOUNTERED, EACH ANGULAR SECTOR WAS REDUCED TO 11.2 DEG, WITH THE SUN NEAR THE MIDPOINT BETWEEN TWO SECTORS. A SPIN-INTEGRATED (ISOTROPIC) MODE, IN WHICH ALL PARTICLES DEPOSITING 7.4 MEV IN THE CsI CRYSTAL (NO ANTICOINCIDENCE REQUIREMENT) WERE COUNTED, WAS ALSO USED. ACCUMULATION TIMES FOR EACH OF THE 12 DIRECTIONAL POLES AND FOR THE CIRNDIRECTIONAL MODE VARIED BETWEEN 10 S AND 112 S (SPACECRAFT SPIN PERIOD WAS ABOUT 1 S) DEPENDING ON THE TELEMETRY BIT RATE. SEE BARTLEY ET AL., "REV. SCI. INSTRUM.", 38, 266, 1967, FOR A MORE DETAILED EXPERIMENT DESCRIPTION.

----- PIONEER 6: WOLFE -----

INVESTIGATION NAME- ELECTROSTATIC ANALYZER

NSSDC ID- 65-105A-06 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - J.H. WOLFE NASA-ARC

BRIEF DESCRIPTION

A QUADRISPHERICAL ELECTROSTATIC ANALYZER WITH EIGHT CONTOGOUOS CURRENT COLLECTORS WAS USED TO STUDY THE DIRECTIONAL INTENSITY OF ELECTRONS AND POSITIVE IONS IN THE SOLAR WIND. IONS WERE DETECTED IN 16 LOGARITHMICALLY EQUISPACED ENERGY-PER-CHARGE (E/Q) STEPS FROM 200 TO 10,000 V. THERE WAS AN ELECTRON MODE OF OPERATION IN WHICH ELECTRONS WERE MEASURED IN EIGHT LOGARITHMICALLY EQUISPACED E/Q STEPS RANGING FROM 1 TO 500 V. THE EIGHT COLLECTORS MEASURED PARTICLES INCIDENT FROM EIGHT DIFFERENT CONTOGOUOS ANGULAR INTERVALS RELATIVE TO THE SPACECRAFT EQUATORIAL PLANE (SAME AS THE ECLIPSTIC PLANE). THERE WERE FOUR 15-DEG INTERVALS, TWO 20-DEG INTERVALS, AND TWO 30-DEG INTERVALS. AS THE SPACECRAFT WAS SPINNING, FLUXES WERE MEASURED IN 15 AZIMUTHAL ANGULAR SECTORS. EIGHT OF THESE SECTORS WERE 5-9/10-DEG WIDE, WERE CONTOGOUOS, AND BRACKETED THE SOLAR DIRECTION. THE REMAINING SEVEN SECTORS WERE 1-DEG WIDE. THREE DIFFERENT MODES OF DATA COLLECTION WERE USED. AT THE HIGHEST BIT RATE (912 BPS), THE FULL SCAN MODE WAS ALTERNATED WITH THE MAXIMUM FLUX MODE AT EACH E/Q STEP. IN THE FULL SCAN MODE, THE MAXIMUM FLUX OBSERVED IN EACH OF THE 15 AZIMUTHAL SECTORS AS THE SPACECRAFT ROTATED WAS RECORDED FOR A GIVEN SINGLE COLLECTOR AT A GIVEN E/Q STEP. DURING 20 SUCCESSIVE OPERATIONS OF THE FULL SCAN MODE (48 SPACECRAFT REVOLUTIONS), THE 16 ION E/Q STEPS AND EIGHT ELECTRON E/Q STEPS WERE EXERCISED FOR A GIVEN COLLECTOR. DURING EIGHT SUCCESSIVE SUCH PERIODS, EACH OF THE EIGHT COLLECTORS WAS EXERCISED. THE FULL CYCLE OF FULL SCAN MODE DATA REQUIRED 400 SPACECRAFT REVOLUTIONS (ABOUT 400 S). SUCH CYCLES WERE REPEATED WITHOUT INTERRUPTION AT THE HIGH BIT RATE. IN THE MAXIMUM FLUX MODE, FOR THE E/Q STEP USED IN THE PRECEDING REVOLUTION OF FULL SCAN MODE OPERATIONS, ALL COLLECTORS WERE OBSERVED FOR ONE REVOLUTION, AND THE MAXIMUM FLUX OBSERVED WAS REPORTED ALONG WITH THE NUMBER OF THE COLLECTOR THAT OBSERVED IT AND THE ANGULAR DIRECTION (2-1/3/16-DEG RESOLUTIONS) OF THE OBSERVATION. AT THE NEXT HIGHEST BIT RATE (256 BPS), THE SHORT SCAN MODE WAS ALTERNATED EVERY SPACECRAFT REVOLUTION WITH THE MAXIMUM FLUX MODE. THE SHORT SCAN MODE WAS THE SAME AS THE FULL SCAN MODE EXCEPT THAT ONLY THE PEAK FLUX IN EACH OF THE EIGHT 5-9/10-DEG-WIDE AZIMUTHAL SECTORS WAS RECORDED. THUS, THIS CYCLE ALSO TOOK 400 SPACECRAFT REVOLUTIONS. AT THE LOW BIT RATES (64, 16, AND 8 BPS), THE MAXIMUM FLUX MODE ALONE WAS USED. THUS, NO AZIMUTHAL DISTRIBUTIONS WERE MEASURED. AT THE LOW BIT RATES, IT TOOK 32 S FOR A COMPLETE SET OF ION MEASUREMENTS AND 16 S FOR A COMPLETE SET OF ELECTRON MEASUREMENTS. AT 64 BPS, THE ION AND ELECTRON MEASUREMENTS WERE TAKEN AND TELEMETERED EVERY 84 S. AT 16 BPS, THEY WERE TAKEN AND TELEMETERED EVERY 336 S. AT 8 BPS, THEY WERE TAKEN AND TELEMETERED EVERY 672 S.

\*\*\*\*\* PIONEER 6 \*\*\*\*\*

SPACECRAFT COMMON NAME- PIONEER 6  
ALTERNATE NAMES- PIONEER-6, PL-6RAK  
03533

NSSDC ID- 68-100A

LAUNCH DATE- 11/08/68 WEIGHT- 147. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

Sponsoring Country/Agency  
UNITED STATES NASA-OSS

**ORBIT PARAMETERS**

ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- 297.6 DAYS  
PERIAPSIS- 0.784 AU RAD

EPOCH DATE- 02/27/76  
INCLINATION- 0.005 DEG  
APOAPSIS- 0.990 AU RAD

**PERSONNEL**

MG - F.D. KOCHENDORFER  
SC - A.G. OPP  
PM - C.P. HALL  
PS - J.H. WOLFE

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-ARC  
NASA-ARC

**BRIEF DESCRIPTION**

PIONEER 9 WAS THE FOURTH IN A SERIES OF SOLAR-ORBITING, SPIN-STABILIZED, AND SOLAR-CELL AND BATTERY-POWERED SATELLITES DESIGNED TO OBTAIN MEASUREMENTS OF INTERPLANETARY PHENOMENA FROM WIDELY SEPARATED POINTS IN SPACE ON A CONTINUOUS BASIS. THE SPACECRAFT CARRIED EXPERIMENTS TO STUDY THE POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND; THE INTERPLANETARY ELECTRON DENSITY (RADIO PROPAGATION EXPERIMENT); SOLAR AND GALACTIC COSMIC RAYS; THE INTERPLANETARY MAGNETIC FIELDS; COSMIC DUST; AND ELECTRIC FIELDS. ALSO, A NEW CODING PROCESS WAS IMPLEMENTED FOR PIONEER 9. ITS MAIN ANTENNA WAS A HIGH-GAIN DIRECTIONAL ANTENNA. THE SPACECRAFT WAS SPIN-STABILIZED AT ABOUT 60 RPM, AND THE SPIN AXES WAS PERPENDICULAR TO THE ECLIPTIC PLANE AND POINTED TOWARD THE SOUTH ECLIPTIC POLE. BY GROUND COMMAND, ONE OF FIVE BIT RATES, ONE OF FOUR DATA FORMATS, AND ONE OF FOUR OPERATING MODES COULD BE SELECTED. THE FIVE BIT RATES WERE 512, 256, 128, 102, AND 8 BPS. THREE OF THE FOUR DATA FORMATS CONTAINED PRIMARILY SCIENTIFIC DATA AND CONSISTED OF 32 SEVEN-BIT WORDS PER FRAME. ONE SCIENTIFIC DATA FORMAT WAS USED AT THE TWO HIGHEST BIT RATES; ANOTHER WAS USED AT THE THREE LOWEST BIT RATES; AND THE THIRD CONTAINED DATA FROM ONLY THE RADIO PROPAGATION EXPERIMENT. THE FOURTH DATA FORMAT CONTAINED MAINLY ENGINEERING DATA. THE FOUR OPERATING MODES WERE REAL TIME, TELEMETRY STORE, DUTY CYCLE STORE, AND MEMORY READOUT. IN THE REAL-TIME MODE, DATA WERE SAMPLED AND TRANSMITTED DIRECTLY (WITHOUT STORAGE) AS SPECIFIED BY THE DATA FORMAT AND BIT RATE SELECTED. IN THE TELEMETRY STORE MODE, DATA WERE STORED AND TRANSMITTED SIMULTANEOUSLY IN THE FORMAT AND AT THE BIT RATE SELECTED. IN THE DUTY CYCLE STORE MODE, A SINGLE FRAME OF SCIENTIFIC DATA WAS COLLECTED AND STORED AT A RATE OF 512 BPS. THE TIME PERIOD BETWEEN WHICH SUCCESSIVE FRAMES WERE COLLECTED AND STORED COULD BE VARIED BY GROUND COMMAND BETWEEN 2 AND 17 MIN TO PROVIDE PARTIAL DATA COVERAGE FOR PERIODS OF UP TO 19 HR AS LIMITED BY THE BIT STORAGE CAPACITY. IN THE MEMORY READOUT MODE, DATA WERE READ OUT AT WHATEVER BIT RATE WAS APPROPRIATE TO THE SATELLITE DISTANCE FROM THE EARTH.

**PIONEER 9, ANDERSON-----****INVESTIGATION NAME- CELESTIAL MECHANICS**

NSSDC ID- 68-100A-08

INVESTIGATIVE PROGRAM  
CODE SL**INVESTIGATION DISCIPLINE(S)**  
CELESTIAL MECHANICS**PERSONNEL**

PI - J.O. ANDERSON

NASA-JPL

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THIS INVESTIGATION WERE TO: (1) OBTAIN PRIMARY DETERMINATIONS OF THE MASSES OF THE EARTH AND MOON AND THE DISTANCE BETWEEN THE EARTH AND SUN (AU); (2) USE THE TRACKING DATA FROM THE WHOLE SERIES OF PIONEER PROBES IN A PROGRAM DESIGNED TO IMPROVE THE EPHEMERIS OF THE EARTH; AND (3) INVESTIGATE THE POSSIBILITY OF A TEST OF GENERAL RELATIVISTIC MECHANICS USING THE PIONEER ORBITS AND DATA. THE INSTRUMENTATION WAS A TWO-WAY S-BAND DOPPLER TRACKING MECHANISM USING HIGH-GAIN ANTENNAS WITH DISK-LIKE PATTERNS IN A PLANE PERPENDICULAR TO THE SPIN-AXIS OF THE SPACECRAFT. WHEN THE SPIN-AXIS WAS PERPENDICULAR TO THE ECLIPTIC, RADIO SIGNALS FROM THE ANTENNA CONTINUOUSLY ILLUMINATED THE EARTH. DATA WERE TRANSMITTED CONTINUOUSLY AND WERE RECEIVED AT GROUND-BASED DEEP SPACE NETWORK STATIONS WITH 26.5-M DIAMETER ANTENNAS AND WITH THE 64-M ANTENNA IN CALIFORNIA.

**PIONEER 9, BERG-----****INVESTIGATION NAME- COSMIC DUST DETECTOR**

NSSDC ID- 68-100A-04

INVESTIGATIVE PROGRAM  
CODE SL**INVESTIGATION DISCIPLINE(S)**  
INTERPLANETARY DUST**PERSONNEL**

PI - O.E. BERG(RETired)

NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO (1) MEASURE THE COSMIC DUST FLUX DENSITY IN THE SOLAR SYSTEM; (2) DETERMINE THE DISTRIBUTION OF COSMIC DUST CONCENTRATIONS IN THE EARTH'S ORBIT; (3) DETERMINE THE GRADIENT, FLUX DENSITY, AND SPEED OF PARTICLES IN METEOR STREAMS; AND (4) PERFORM AN IN-FLIGHT CONTROL EXPERIMENT ON THE RELIABILITY OF THE MICROPHONE AS A COSMIC DUST SENSOR. THE EXPERIMENT INSTRUMENTATION WAS IDENTICAL TO THAT CARRIED ON PIONEER 8, CONSISTING ESSENTIALLY OF TWO THIN FILM-GRID DETECTORS (SEPARATED BY A DISTANCE OF 5 CM) THAT PRODUCED AN ELECTRICAL SIGNAL WHEN THE FILM WAS PENETRATED BY A MICROMETEOROID. EACH FILM HAD A SENSITIVE AREA OF 100 SQ CM AND WAS COMPOSED OF 16 SEGMENTS THAT PROVIDED BOTH

THE DIRECTION AND THE TIME-OF-FLIGHT NEEDED FOR THE METEOROID TO TRAVERSE THE 5-CM DISTANCE BETWEEN THE FRONT FILM AND REAR FILM SENSOR. THE COMBINED RESULTS OF THE PIONEER 8 AND 9 COSMIC DUST EXPERIMENTS LENT STRONG SUPPORT TO THE HYPOTHESIS THAT THE Bulk OF RETROGRADE DUST IS OF COMETARY ORIGIN.

**PIONEER 9, ESHLERAN-----****INVESTIGATION NAME- TWO-FREQUENCY BEACON RECEIVER**

NSSDC ID- 68-100A-03

INVESTIGATIVE PROGRAM  
CODE SL**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
IONOSPHERES AND RADIO PHYSICS**PERSONNEL**

PI - V.R. ESHLERAN  
OI - T.A. CROFT  
OI - M.T. HOWARD  
OI - R.L. LEADBARD  
OI - R.A. LONG  
OI - A.M. PETERSON

STANFORD U  
SRI INTERNATIONAL  
STANFORD U  
SRI INTERNATIONAL  
SRI INTERNATIONAL  
STANFORD U

**BRIEF DESCRIPTION**

BOTH 423.5-MHz AND ITS 2/17 SUBHARMONIC 49.0-MHz SIGNALS WERE TRANSMITTED FROM A 4.6-M STEERABLE PARABOLIC ANTENNA AT STANFORD UNIVERSITY TO THE TWO-FREQUENCY RADIO RECEIVER ON THE SPACECRAFT. THE HIGH-FREQUENCY SIGNAL SERVED AS A REFERENCE SIGNAL SINCE ITS PROPAGATION TIME WAS NOT APPRECIABLY DELAYED. THE LOW-FREQUENCY SIGNAL WAS DELAYED IN PROPORTION TO THE TOTAL ELECTRON CONTENT IN THE PROPAGATION PATH. ON THE SPACECRAFT, A PHASE-LOCKED RECEIVER COUNTED THE BEAT FREQUENCY ZERO CROSSINGS OF THE RECEIVED SIGNALS TO OBTAIN MEASUREMENTS OF PHASE-PATH DIFFERENCES. DIFFERENTIAL DELAY OF THE GROUP VELOCITY WAS ALSO OBSERVED, AND THESE VALUES WERE TELEMETERED TO THE GROUND STATION AND USED TO CALCULATE THE TOTAL ELECTRON CONTENT. THE IONOSPHERIC CONTRIBUTION (UP TO A SELECTED ALTITUDE OBTAINED FROM OTHER EXPERIMENTAL TECHNIQUES) COULD BE SUBTRACTED TO PRODUCE DATA DESCRIBING THE INTERPLANETARY ELECTRON CONTENT OF THE SOLAR WIND AND ITS VARIATIONS. MORE DETAILED DESCRIPTIONS OF THE EXPERIMENT CAN BE FOUND IN J. GEOPHYS. RES., 71, 3525-3527, AND IN RADIO SCIENCE, 6, 57-63.

**PIONEER 9, MCCRACKEN-----****INVESTIGATION NAME- COSMIC-RAY ANISOTROPY**

NSSDC ID- 68-100A-05

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
COSMIC RAYS**PERSONNEL**

PI - K.G. MCCRACKEN  
OI - U.R. RAO  
OI - W.C. BARTLEY

CSIRO  
1980 SATELLITE CENTER  
NATL ACADEMY OF SCI

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF A CSI SCINTILLATOR AND THREE SOLID-STATE TELESCOPES. THE CSI SCINTILLATOR WAS COLLIMATED BY AN ANTICOINCIDENCE PLASTIC SCINTILLATOR AND HAD A CONICAL APERTURE WITH A 38.2-DEG HALF-ANGLE. THE SCINTILLATOR LOOK DIRECTION WAS CENTERED IN THE ECLIPTIC PLANE. THREE SOLID-STATE DETECTORS WERE ORIENTED IN A FAN ARRANGEMENT WITH RESPECT TO A FOURTH SOLID-STATE DETECTOR SUCH THAT EACH OF THE FIRST THREE DETECTORS FORMED A TELESCOPE WITH THE FOURTH DETECTOR. EACH OF THE THREE TELESCOPES THUS FORMED HAD AN ACCEPTANCE CONE OF 35-DEG HALF-ANGLE. THE MEAN VIEWING DIRECTIONS OF THE TELESCOPES WERE IN THE ECLIPTIC PLANE AND 45 DEG ABOVE AND BELOW THAT PLANE, RESPECTIVELY. TWO CONCURRENT MODES OF COUNTING WERE EMPLOYED. IN THE FIRST MODE, COUNTS WERE ACCUMULATED IN EIGHT SEPARATE 5-DEG INTERVALS DURING THE SPACECRAFT SPIN; WHILE, IN THE SECOND, SPIN-INTEGRATED COUNTS WERE ACQUIRED. IN THE FIRST MODE, THE SCINTILLATOR SEPARATELY MEASURED PARTICLES WITH ENERGIES IN THE RANGES 7.0 TO 21.5 MEV/NUCLEON AND 19.7 TO 69.0 MEV/NUCLEON (NO SPECIES DISCRIMINATION) WHILE EACH SOLID-STATE TELESCOPE SEPARATELY MEASURED PROTONS IN THE ENERGY RANGES 3.3 TO 3.6 MEV AND 3.6 TO 6.7 MEV. IN THE SECOND MODE, THE SCINTILLATOR SEPARATELY MEASURED PARTICLES IN SIX CONTIGUOUS ENERGY INTERVALS BETWEEN 4.5 AND 48 MEV/NUCLEON (INTERVAL LOWER LIMITS AT 4.5, 7.0, 9.6, 13, 21, AND 28 MEV/NUCLEON), WHILE EACH OF THE SOLID-STATE TELESCOPES SEPARATELY MEASURED PROTONS IN THE ENERGY RANGES 1 TO 8, 1 TO 5, 1 TO 3, AND 4 TO 6 MEV AND ALPHA PARTICLES IN THE ENERGY RANGE 4 TO 8 MEV. DURING EACH 224-BIT MAIN TELEMETRY FRAME, TWO FIRST-MODE 9-BIT ACCUMULATORS AND ONE SECOND-MODE 9-BIT ACCUMULATOR WERE READ OUT. IN-FLIGHT CALIBRATION OF THE SCINTILLATOR AND OF SOME OF THE ELECTRONICS WAS PERFORMED DAILY. SEE BURAKA ET AL, "IEEE TRANS. NUC. SCI.", NS-17, 18-24, 1970, FOR A MORE DETAILED EXPERIMENT DESCRIPTION.

**PIONEER 9, SCARF-----****INVESTIGATION NAME- PLASMA WAVE DETECTOR**

NSSDC ID- 68-100A-07

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - J.H. SCARF  
OI - J.M. GREEN  
OI - G.M. CHODK  
OI - R.W. FREDERICKS

TRW SYSTEMS GROUP  
TRW SYSTEMS GROUP  
GAINES M. CHODK ASSOC  
TRW SYSTEMS GROUP

BRIEF DESCRIPTION

ELECTROSTATIC AND ELECTROMAGNETIC PLASMA WAVES WERE MEASURED IN THE SOLAR WIND NEAR 1 AU USING AN UNBALANCED ELECTRIC DIPOLE ANTENNA. THE 423-MHZ STANFORD UNIVERSITY ANTENNA, WHICH SERVED AS THE SENSOR, WAS CAPACITIVELY COUPLED TO THREE TELEMETRY CHANNELS. CHANNEL 1 WAS A 15-PERCENT BANDPASS FILTER CENTERED AT 400 MHZ; CHANNEL 2 WAS A 15-PERCENT BANDPASS FILTER CENTERED AT 30 MHZ. THESE CHANNELS WERE EACH SAMPLED 64 TIMES PER TELEMETRY SEQUENCE. CHANNEL 3 WAS A BROADBAND 100-MHZ TO 100-KHZ CHANNEL. THE BROADBAND CHANNEL WAS FED INTO A COUNT RATE METER THAT MEASURED THE NUMBER OF POSITIVE-GOING PULSES PER UNIT TIME HAVING AMPLITUDES LARGE ENOUGH TO CROSS THE PRESENT TRIGGER LEVEL. THE TRIGGER LEVEL WAS VARIED THROUGH EIGHT STEPS, EIGHT TIMES PER TELEMETRY SEQUENCE. THE TRIGGER LEVELS, TOGETHER WITH THE COUNT RATE AT EACH LEVEL, GAVE A MEASURE OF THE BROADBAND POWER SPECTRUM. DUE TO AMBIENT CONDITIONS, THESE DATA USUALLY REPRESENT THE POWER AT ABOUT 100 MHZ. THE TELEMETRY SEQUENCE WAS REPEATED OVER TIME INTERVALS FROM 7 MIN 29 S TO 472 MIN 52 S.

----- PIONEER 9: SONETT-----

INVESTIGATION NAME- TRIAXIAL MAGNETOMETER

NSSDC ID- 68-100A-01 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - C.P. SONETT  
OI - D.B. COLBURN

U OF ARIZONA  
NASA-ARC

BRIEF DESCRIPTION

A BOOM-MOUNTED, TRIAXIAL FLUXGATE MAGNETOMETER WAS USED TO STUDY THE INTERPLANETARY MAGNETIC FIELD AND ITS FLUCTUATIONS. THE SENSORS WERE ORTHOGONALLY MOUNTED WITH ONE AXIS PARALLEL TO THE SPACECRAFT SPIN AXIS. UPON COMMAND, A MOTON INTERCHANGED A SENSOR IN THE SPIN PLANE WITH THE SENSOR ALONG THE SPIN AXIS, ENABLING IN-FLIGHT DETERMINATION OF ZERO LEVELS. EVERY 70 HOURS, THE INSTRUMENT WAS COMMANDED INTO A SELF-CALIBRATE SEQUENCE, AND THIS WAS OFTEN REPEATED AFTER THE SENSORS WERE FLIPPED. THE INSTRUMENT, WHICH HAD A DYNAMIC RANGE OF PLUS OR MINUS 200 NT WITH A RESOLUTION OF PLUS OR MINUS 0.2 NT, WAS CAPABLE OF IN-FLIGHT DEMODULATION OF THE SIGNALS RECEIVED FROM THE TWO SENSORS IN THE SPIN PLANE. EACH MAGNETIC FIELD COMPONENT WAS DIGITIZED INTO A 10-BIT TELEMETRY WORD. NINE MAGNETIC FIELD COMPONENTS, COMPRISING THREE MAGNETIC FIELD VECTORS, WERE TRANSMITTED IN EACH SPACECRAFT TELEMETRY FRAME.

----- PIONEER 9: WEBBER-----

INVESTIGATION NAME- COSMIC-RAY TELESCOPE

NSSDC ID- 68-100A-06 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - J.A. WEBBER

U OF NEW HAMPSHIRE

BRIEF DESCRIPTION

THIS EXPERIMENT UTILIZED A TELESCOPE COMPRISING OF FIVE SOLID-STATE SENSORS, A CERENKOV DETECTOR, AND AN ANTICOINCIDENCE SHIELD. THE TELESCOPE AXIS WAS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS. AS DETERMINED BY TWO COINCIDENCE MODES AND ELECTRONIC DISCRIMINATION OF SENSOR OUTPUT PULSES, PARTICLES MEASURED WERE ELECTRONS IN THREE CONTIGUOUS ENERGY INTERVALS BETWEEN 0.31 AND 5.1 MEV, PROTONS IN FIVE CONTIGUOUS ENERGY INTERVALS BETWEEN 2.2 AND 42 MEV, AND ALPHA PARTICLES IN THOSE CONTIGUOUS ENERGY INTERVALS BETWEEN 5.1 AND 42 MEV/NUCLEON. A THIRD COINCIDENCE MODE MEASURED THE SUM OF COUNTS DUE TO ELECTRONS ABOVE 0.6 MEV AND NUCLEI ABOVE 14 MEV/NUCLEON. A FOURTH COINCIDENCE MODE MEASURED THE SUM OF NUCLEI ABOVE 42 MEV/NUCLEON AND ELECTRONS ABOVE 5.1 MEV. SPACECRAFT SPIN-INTEGRATED DIRECTIONAL FLUXES WERE MEASURED IN THE VARIOUS MODES. ACCUMULATION TIMES AND READOUT INTERVALS WERE DEPENDENT ON THE TELEMETRY BIT RATE AND WERE TYPICALLY IN TENS OF SECONDS. IN ALL CASES, THEY WERE LONGER THAN THE SPACECRAFT SPIN PERIOD.

ORIGINAL PAGE IS  
OF POOR QUALITY

----- PIONEER 9: WOLFE-----

INVESTIGATION NAME- ELECTROSTATIC ANALYZER

NSSDC ID- 68-100A-02 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - J.H. WOLFE  
OI - D.D. HERZUBIN

NASA-ARC  
NASA-ARC

BRIEF DESCRIPTION

A TRUNCATED HEMISPHERICAL ELECTROSTATIC ANALYZER (120-DEG TOTAL PARALLEL PLATE CURVATURE) WITH THREE CONTIGUOUS CURRENT COLLECTORS WAS USED TO STUDY THE DIRECTIONAL INTENSITY OF THE ELECTRONS AND POSITIVE IONS IN THE SOLAR WIND. IONS WERE DETECTED IN 30 LOGARITHMICALLY EQUISPACED ENERGY PER UNIT CHARGE (E/Q) STEPS FROM 150 TO 15,000 V. THERE WAS AN ELECTRON MODE OF OPERATION IN WHICH ELECTRONS WERE MEASURED IN 34 LOGARITHMICALLY EQUISPACED E/Q STEPS RANGING FROM 12 TO 1000 V. THERE WAS ALSO A ZERO E/Q, OR BACKGROUND, STEP. THE THREE COLLECTORS MEASURED PARTICLES INCIDENT FROM THREE DIFFERENT CONTIGUOUS ANGULAR INTERVALS RELATIVE TO THE SPACECRAFT EQUATORIAL PLANE (SAME AS THE ECLIPSTIC PLANE). TWO COLLECTORS MEASURED FLUX FROM 10 TO 60 DEG ON EITHER SIDE OF THE SPACECRAFT EQUATORIAL PLANE, AND THE THIRD MEASURED FLUX IN A 20-DEG INTERVAL CENTERED ON THE SPACECRAFT EQUATORIAL PLANE. AS THE SPACECRAFT WAS SPINNING, FLUXES WERE MEASURED IN 23 POSSIBLE 2-13/16-DEG WIDE AZIMUTHAL ANGULAR SECTORS. SEVENTEEN OF THESE SECTORS WERE CONTIGUOUS AND BRACKETED THE SOLAR DIRECTION. THE REMAINING SIX SECTORS WERE WIDELY SPACED. THE INSTRUMENT HAD THREE MODES OF DATA COLLECTION -- POLAR SCAN, AZIMUTHAL SCAN, AND MAXIMUM FLUX. AT THE TWO HIGHEST BIT RATES (512 AND 256 BPS), THE POLAR SCAN MODE WAS ALTERNATED WITH THE AZIMUTHAL SCAN MODE AT EACH E/Q STEP. IN THE POLAR SCAN MODE, ALL THREE COLLECTORS WERE OBSERVED, AND THE PEAK FLUX OBTAINED AND THE AZIMUTHAL DIRECTION (TO 2-13/16 DEG) OF THE OBSERVATION WERE REPORTED FOR EACH COLLECTOR. IN THE AZIMUTHAL SCAN MODE, THE PEAK FLUX OBTAINED IN THE 23 AZIMUTHAL SECTORS WAS RECORDED FOR THE CENTRAL COLLECTOR AT EACH E/Q STEP. AT THE LOW BIT RATES (64, 16, AND 8 BPS), THE MAXIMUM FLUX MODE WAS USED AT EACH E/Q STEP FOLLOWED BY EITHER (1) FOR IONS, A POLAR SCAN AND AN AZIMUTHAL SCAN AT THAT E/Q STEP WHERE THE PEAK FLUX MEASUREMENT DURING THE MAXIMUM FLUX MODE WAS OBTAINED, OR (2) FOR ELECTRONS, A POLAR SCAN AND AN AZIMUTHAL SCAN AT E/Q = 100 V. IN THE MAXIMUM FLUX MODE, ONLY THE CENTRAL COLLECTOR WAS OBSERVED, AND THE PEAK FLUX OBTAINED AND THE AZIMUTHAL DIRECTION (TO 2-13/16 DEG) OF THE OBSERVATION WERE REPORTED. A COMPLETE SET OF MEASUREMENTS CONSISTED OF SEVEN SETS OF ION MEASUREMENTS (AT EACH E/Q STEPS) AND ONE SET OF ELECTRON MEASUREMENTS (AT EACH E/Q STEP). AT THE HIGH BIT RATES (512 AND 256 BPS) ONE SET OF ION MEASUREMENTS TOOK 67 S AND ONE SET OF ELECTRON MEASUREMENTS 38 S. AT THE LOW BIT RATES (64, 16, AND 8 BPS), ONE SET OF ION MEASUREMENTS TOOK 37 S AND ONE SET OF ELECTRON MEASUREMENTS 28 S. AT 64 BPS, A COMPLETE SET OF MEASUREMENTS (SEVEN IONS PLUS ONE ELECTRON) WAS TAKEN AND TELEMEASURED EVERY 402.5 S. AT 16 BPS, IT TOOK 1610 S, AND, AT 8 BPS, IT TOOK 3220 S.

----- PIONEER 10-----

SPACECRAFT CYPON NAME- PIONEER 10  
ALTERNATE NAMES- PIONEER-F, PL-7230  
DSR60

NSSDC ID- 72-012A

LAUNCH DATE- 03/05/72 WEIGHT- 231. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- JUPITER FLYBY

PERSONNEL  
RG - F.D. KOCHENDORFER  
SC - A.G. OPP  
PR - C.P. HALL  
PS - J.H. WOLFE

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-ARC  
NASA-ARC

BRIEF DESCRIPTION

THIS MISSION WAS THE FIRST TO BE SENT TO THE OUTER SOLAR SYSTEM, AND AFTER ENCOUNTERING THE PLANET JUPITER IT ASSUMED A TRAJECTORY THAT WOULD ESCAPE FROM THE SOLAR SYSTEM. THE SPACECRAFT FLYBY WAS MOUNTED BEHIND A 2.70-M-DIAMETER PARABOLIC DISH ANTENNA THAT WAS 46 CM DEEP. THE SPACECRAFT STRUCTURE WAS A 36-CM-DEEP FLAT EQUIPMENT COMPARTMENT, THE TOP AND BOTTOM BEING REGULAR HEPTAGONS. ITS SIDES WERE 71 CM LONG. ONE SIDE JOINED A SMALLER COMPARTMENT THAT CARRIED THE SCIENTIFIC EXPERIMENTS. THE HIGH-GAIN ANTENNA FEED WAS SITUATED ON THREE STRUTS, WHICH PROJECTED FORWARD ABOUT 1.2 M. THIS FEED WAS TOPPED WITH A MEDIUM-GAIN ANTENNA. A LOW-GAIN OMNI-DIRECTIONAL ANTENNA EXTENDED ABOUT 0.76 M BEHIND THE EQUIPMENT COMPARTMENT AND WAS MOUNTED BELOW THE HIGH GAIN ANTENNA. POWER FOR THE SPACECRAFT WAS OBTAINED BY FOUR SNAP 19 RADIOISOTOPE THERMONUCLEAR GENERATORS (RTGs), WHICH WERE HELD ABOUT 3 M FROM

THE CENTER OF THE SPACECRAFT BY TWO THREE-ROD TRUSSES 120 DEG APART. A THIRD BOOM EXTENDED 6.6 M FROM THE EXPERIMENT COMPARTMENT TO HOLD THE MAGNETOMETER AWAY FROM THE SPACECRAFT. THE FOUR RTG'S GENERATED ABOUT 155 WATTS AT LAUNCH AND DECAYED TO APPROXIMATELY 140 WATTS BY THE TIME THE SPACECRAFT REACHED JUPITER, 21 MONTHS AFTER LAUNCH IN DECEMBER 1973. THERE WERE THREE REFERENCE SENSORS -- STAR SENSOR FOR CANOPUS, AND TWO SUN SENSORS. ATTITUDE POSITION COULD BE CALCULATED FROM THE REFERENCE DIRECTIONS TO THE EARTH AND THE SUN WITH THE KNOWN DIRECTION TO CANOPUS AS A BACKUP. THREE PAIRS OF ROCKET THRUSTERS PROVIDED SPIN RATE CONTROL (MAINTAINED AT 4.8 RPM) AND CHANGED THE VELOCITY OF THE SPACECRAFT. THESE THRUSTERS COULD BE PULSED OR FIRED STEADILY BY COMMAND. COMMUNICATIONS WERE MAINTAINED VIA THE OMNIDIRECTIONAL AND MEDIUM-GAIN ANTENNAS, WHICH OPERATED TOGETHER, CONNECTED TO ONE RECEIVER. WHILE THE HIGH-GAIN ANTENNA WAS CONNECTED TO ANOTHER RECEIVER, THESE RECEIVERS COULD BE INTERCHANGED BY COMMAND TO PROVIDE SOME REDUNDANCY. TWO RADIO TRANSMITTERS, COUPLED TO TWO TRAVELING WAVE TUBE AMPLIFIERS, PRODUCED 8 WATTS AT 2292 MHZ EACH. UPLINK WAS ACCOMPLISHED AT 2110 MHZ WHILE DATA TRANSMISSION DOWNLINK WAS AT 2292 MHZ. THE DATA WERE RECEIVED BY NASA'S DEEP SPACE NETWORK. THE SPACECRAFT WAS TEMPERATURE-CONTROLLED BETWEEN MINUS 23 DEG C AND PLUS 38 DEG C. FIFTEEN EXPERIMENTS WERE CARRIED TO STUDY THE INTERPLANETARY AND PLANETARY MAGNETIC FIELDS; SOLAR WIND PARAMETERS; COSMIC RAYZ TRANSITION REGION OF THE HELIOSPHERE; NEUTRAL HYDROGEN ABUNDANCE; DISTRIBUTION, SIZE, MASS, FLUX, AND VELOCITY OF BUST PARTICLES; JOVIAN AURORAE; JOVIAN RADIO WAVES; ATMOSPHERE OF JUPITER AND SOME OF ITS SATELLITES, PARTICULARLY IO; AND TO PHOTOGRAPH JUPITER AND ITS SATELLITES. EQUIPMENT CARRIED FOR THESE EXPERIMENTS WERE -- MAGNETOMETER, PLASMA ANALYZER, CHARGED PARTICLE DETECTOR, IONIZING DETECTOR, NON-IMAGING TELESCOPES WITH OVERLAPPING FIELDS OF VIEW TO DETECT SUNLIGHT REFLECTED FROM PASSING METEOROIDS, SEALED PRESSURIZED CELLS OF ARGON AND NITROGEN GAS FOR MEASURING THE PENETRATION OF METEOROIDS, UV PHOTOMETER, IR RADIOMETER, AND AN IMAGING PHOTOPOLARIMETER, WHICH PRODUCED PHOTOGRAPHS AND MEASURED POLARIZATION. FURTHER SCIENTIFIC INFORMATION WAS OBTAINED FROM THE TRACKING AND OCCULTATION DATA. THE SPACECRAFT ACHIEVED ITS CLOSEST APPROACH ON DECEMBER 3, 1973, WHEN IT REACHED APPROXIMATELY 3 JOVIAN RADII (ABOUT 210,000 KM). THE SPACECRAFT CONTAINS PLAQUES THAT HAVE DRAWINGS DEPICTING A MAN, A WOMAN, AND THE LOCATION OF THE SUN AND THE EARTH IN OUR GALAXY.

----- PIONEER 10, GEHRELS -----

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 72-012A-09

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETOLOGY  
CELESTIAL MECHANICS

PERSONNEL

PI - J.D. ANDERSON  
OI - G.W. NULL

NASA-JPL  
NASA-JPL

BRIEF DESCRIPTION

TWO-WAY DOPPLER TRACKING OF THE SPACECRAFT WAS USED TO MAKE MORE PRECISE DETERMINATIONS OF PLANETARY MASSES, THE HELIOCENTRIC ORBIT OF JUPITER, AND THE GRAVITATIONAL FIELDS OF THE SUN, JUPITER, AND THE GALILEAN SATELLITES.

----- PIONEER 10, FILLIUS -----

INVESTIGATION NAME- JOVIAN TRAPPED RADIATION

NSSDC ID- 72-012A-05

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.W. FILLIUS  
OI - C.E. MCILWAIN

U OF CALIF, SAN DIEGO  
U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF AN ARRAY OF FIVE PARTICLE DETECTORS WITH ELECTRON THRESHOLDS IN THE RANGE .01 TO 35 MEV AND PROTON THRESHOLDS IN THE RANGE 0.15 TO 80 MEV. A CERENKOV COUNTER (C) HAD FOUR OUTPUT CHANNELS (C1, C2, C3, AND CDC) SENSITIVE TO ELECTRONS HAVING ENERGIES ABOVE 6, 9, 13, AND 1 MEV, RESPECTIVELY. AN ELECTRON SCATTER COUNTER (E) HAD THREE OUTPUT CHANNELS (E1, E2, AND E3) SENSITIVE TO ELECTRONS ABOVE .16, .26, AND .46 MEV. A MINIPUR IONIZATION COUNTER (M) HAD THREE OUTPUT CHANNELS, M1 SENSITIVE TO ELECTRONS HAVING ENERGIES GREATER THAN 35 MEV, M2 THAT MEASURED BACKGROUND, AND M3 THAT WAS SENSITIVE TO PROTONS HAVING ENERGIES GREATER THAN 80 MEV. THE LAST TWO SENSORS WERE SCINTILLATOR DETECTORS (SP AND SE), BOTH OF WHICH HAD ENERGY THRESHOLDS OF 10 KEV FOR ELECTRONS AND 150 KEV FOR PROTONS. THE SENSITIVITY OF THE SE DETECTOR TO PROTONS WAS ABOUT A FACTOR OF 10 LOWER THAN ITS SENSITIVITY TO ELECTRONS. THUS, THE SEDC CHANNEL EFFECTIVELY MEASURED THE ELECTRON FLUX, WHICH COULD THEN BE SUBTRACTED FROM THE SPDC CHANNEL RESPONSE TO OBTAIN THE PROTON FLUX. SEVERAL OTHER CHANNELS LISTED ABOVE REQUIRED CORRECTIONS TO OBTAIN THE FLUXES OF THE SPECIES INDICATED. THREE OF THE CHANNELS (CDC, SPDC, AND SEDC) WERE READ OUT THROUGH A COMMON ELECTROMETER.

DUE TO A MALFUNCTION THAT OCCURRED BETWEEN LAUNCH AND JOVIAN ENCOUNTER, THESE THREE CHANNELS PRODUCED NO USABLE ENCOUNTER DATA. THE DETECTOR CHANNELS COULD BE PROGRAMMED FOR READ-OUT IN ANY ONE OF FOUR PATTERNS AT EACH OF THE EIGHT SPACECRAFT BIT RATE MODES. DURING ENCOUNTER WHEN THE SPACECRAFT WAS OPERATING IN THE HIGHEST BIT RATE MODE, THE MINIMUM TIME TO SAMPLE ONE CHANNEL WAS 1.5 S AND THE TIME TO OBTAIN A COMPLETE SCAN THROUGH ALL CHANNELS WAS 108 S. SINCE THE DIRECTIONAL DETECTORS POINTED PERPENDICULAR TO THE SPIN AXES AND THE SPIN RATE WAS 5 RPM, PITCH ANGLE MEASUREMENTS WERE OBTAINED. WHILE THE EXPERIMENT WAS PRIMARILY DESIGNATED FOR ENCOUNTER STUDIES, SOME DATA WERE OBTAINED AT LOW RATES IN INTERPLANETARY SPACE. A DESCRIPTION OF THE INSTRUMENTATION AND INITIAL RESULTS WAS PUBLISHED IN JGR, 79, 3589, 1974.

----- PIONEER 10, GEHRELS -----

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 72-012A-07

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - T. GEHRELS	U OF ARIZONA
OI - D.L. COFFEEN	NASA-GISS
OI - J. HAMEEN-ANTILA	U OF ARIZONA
OI - C.E. KENKNIGHT	U OF ARIZONA
OI - R.F. HUMMER	SANTA BARBARA RES CTR
OI - M.G. TOMASKO	U OF ARIZONA
OI - W. SWINDELL	U OF ARIZONA

BRIEF DESCRIPTION

THE IMAGING PHOTOPOLARIMETER (IPP) EXPERIMENT WAS USED DURING JOVIAN ENCOUNTER TO MAKE SIMULTANEOUS TWO-COLOR (BLUE - 3900 TO 4900 Å, RED - 5800 TO 7000 Å) POLARIMETRIC AND RADIOMETRIC MEASUREMENTS, AND MODERATE-RESOLUTION (ABOUT 200 KM AT BEST) SPIN-SCAN IMAGES OF JUPITER AND THE JOVIAN SATELLITES. THE POLARIMETRIC AND RADIOMETRIC WORK WAS PERFORMED USING AN 8-X 8-MM FIELD-STOP APERTURE, WHILE THE SPIN-SCAN IMAGING USED A 0.5- BY 0.5-MM FIELD-STOP. RELATIVE RADIOMETRIC CALIBRATION WAS DERIVED USING AN INTERNAL TUNGSTEN LAMP. LONG-TERM ABSOLUTE CALIBRATION OF THE INSTRUMENT WAS ACCOMPLISHED BY MEANS OF A SUNLIGHT DIFFUSER/ATTENUATOR ELEMENT LOCATED IN THE SPACECRAFT ANTENNA STRUCTURE; I.E., PRIMARY RADIOMETRIC CALIBRATION WAS OBTAINED THROUGHOUT THE MISSION BY PERIODICALLY COMMANDING THE TELESCOPE TO VIEW THIS DIFFUSE BACKLITTED (SUNLIGHT) SOURCE. THE EXPERIMENTAL TRAIN FOR THE IPP PACKAGE CONSISTED OF THE FOLLOWING ELEMENTS -- (1) A NEAR-DIFFRACTION-LIMITED 2.54-CM MAKOTOV CATADIOPTIC TELESCOPE (F/3.4), (2) A FOCAL PLANE WHEEL CONTAINING FIELD-OF-VIEW APERTURES, DEPOLARIZERS, CALIBRATION SOURCE, ETC., (3) A WOLLASTON PRISM TO SPLIT LIGHT INTO TWO ORTHOGONALLY POLARIZED BEAMS, (4) A 45-DEG DICROHOMATIC MIRROR THAT REFLECTED WAVELENGTHS LESS THAN 5500 Å (BLUE BEAM) AND TRANSMITTED ALL LIGHT OF GREATER WAVELENGTH (RED BEAM), (5) FOR EACH SPECTRAL BEAM (TWO POLARIZATIONS), A FILTERING COATED RELAY LENS AND FOLDING MIRRORS, AND (6) FOR EACH SPECTRAL BEAM, TWO BENDIX CHANNELTRON DETECTORS (BLUE - BIALKALI S-11 PHOTOCATHODES RED S-20 PHOTOCATHODES) TO REGISTER THE INTENSITY IN EACH POLARIZATION COMPONENT.

----- PIONEER 10, JUDGE -----

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 72-012A-06

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.L. JUDGE	U OF SOUTHERN CALIF
OI - R.W. CARLSON	NASA-JPL

BRIEF DESCRIPTION

THIS EXPERIMENT, CONSISTING OF A BROADBAND PHOTOMETER SENSITIVE BETWEEN 200 AND 800 Å, OBSERVED EVIDENCE OF HELIUM, WHICH IN TURN INDICATED INTERACTIONS BETWEEN CHARGE PARTICLES AND NEUTRAL HYDROGEN DURING THE CRUISE PHASE OF THE MISSION. THIS EXPERIMENT WAS USED TO SEARCH FOR THE SUPERSONIC TO SUBSONIC TRANSITION REGION IN THE SOLAR WIND. DURING THE JOVIAN ENCOUNTER, THIS EXPERIMENT WAS USED TO LOOK FOR EVIDENCE OF AN AURORAL OVAL ON THE JOVIAN DAYSIDE, TO FIND THE RATIO OF HYDROGEN TO HELIUM IN THE JOVIAN ATMOSPHERE, AND TO FIND THE TEMPERATURE OF THE OUTER PORTION OF THE JOVIAN ATMOSPHERE.

----- PIONEER 10, KINARD -----

INVESTIGATION NAME- METEOROID DETECTORS

NSSDC ID- 72-012A-04

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
INTERPLANETARY DUST

**PERSONNEL**

PI - W.H. KINARD	NASA-LARC
OI - R.E. TURNER	NASA-MSFC
OI - J.M. ALVAREZ	NASA-LARC
OI - D.H. HUMES	NASA-LARC
OI - R.L. O'NEAL	NASA-LARC

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO MEASURE THE NUMBER OF METEOROID IMPACTS ON THE PIONEER 10 SPACECRAFT BY MEANS OF 12 PANELS, EACH CONTAINING 18 PRESSURIZED CELLS, MOUNTED ON THE BACK OF THE ANTENNA DISK. THE TOTAL EXPOSED AREA WAS 0.465 SQ M. EACH PANEL OF GAS-FILLED CELLS CONSISTED OF A 2.54E-5 M (1-MIL) THICK AND A 5.08E-5 M (2-MIL) THICK SHEET OF STAINLESS STEEL WELDED TOGETHER IN SUCH A WAY THAT MANY SMALL POCKETS OF GAS WERE LEFT BETWEEN THEM. WHENEVER A POCKET WAS PUNCTURED, THE GAS ESCAPED AND A COLD CATHODE DEVICE DETECTED THE LOSS. THE RATE OF PRESSURE LOSS INDICATED THE SIZE OF THE HOLE MADE, AND THUS THE PARTICLE'S MASS AND INCIDENT ENERGY COULD BE DETERMINED. THE COMBINATION OF THESE DATA WITH TRAJECTORY DATA PROVIDED AN INDICATION OF THE SPATIAL DENSITY OF THE PARTICLES. THE 2.54E-5 M THICK SIDE OF THE GAS PANEL WAS EXPOSED TO THE INTERPLANETARY MEDIUM, AND PENETRATIONS OF THE CELLS FROM THAT SIDE INDICATED ENCOUNTERS WITH PARTICLES HAVING MASSES OF 1 NANOGRAM OR MORE. SOME 300 TO 400 HITS WERE EXPECTED BY THE TIME THE SPACECRAFT COMPLETED ITS 200-DAY JOURNEY THROUGH THE ASTEROID BELT.

**----- PIONEER 10, SIMPSON -----****INVESTIGATION NAME- S-BAND OCCULTATION**

NSSDC ID- 72-012A-10	INVESTIGATIVE PROGRAM CODE SL
INVESTIGATION DISCIPLINE(S) IONOSPHERES AND RADIO PHYSICS PLANETARY ATMOSPHERES	

**PERSONNEL**

PI - A.J. KLIORE	NASA-JPL
OI - G. FJELDBO	NASA-JPL
OI - D.L. CAIN	NASA-JPL
OI - B.L. SEIDEL	NASA-JPL
OI - S.I. RASOOL	NASA HEADQUARTERS

**BRIEF DESCRIPTION**

THIS EXPERIMENT UTILIZED THE S-BAND (2292 MHZ, 8 W) SPACECRAFT RADIO TRANSMITTER SIGNAL CHARACTERISTICS TO OBTAIN INFORMATION ABOUT THE IONOSPHERES AND ATMOSPHERES OF JUPITER AND ITS SATELLITE IO. ENTRANCE INTO AND EXIT FROM JUPITER AND IO OCCULTATION PROVIDED CHANGES IN THE SIGNAL CHARACTERISTICS FROM WHICH ATMOSPHERIC TEMPERATURE, PRESSURE, AND ELECTRON DENSITY PROFILES COULD BE CALCULATED. TEMPERATURE AND PRESSURE PROFILES WERE LIMITED TO LEVELS ABOVE THE PRESSURE OF ONE EARTH ATMOSPHERE. SIGNAL OCCULTATION ALSO PROVIDED A DETERMINATION OF THE PLANETARY DIAMETER.

**----- PIONEER 10, MCDONALD -----****INVESTIGATION NAME- COSMIC-RAY SPECTRA**

NSSDC ID- 72-012A-12	INVESTIGATIVE PROGRAM CODE SL/CO-OP
INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS COSMIC RAYS	

**PERSONNEL**

PI - F.R. MCDONALD	NASA-GSFC
OI - K.G. McCracken	CSIRO
OI - W.P. Webber	U OF NEW HAMPSHIRE
OI - E.C. Roelof	APPLIED PHYSICS LAB
OI - J.H. Trainor	NASA-GSFC
OI - B.J. Teggarde	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF THREE MULTI-ELEMENT SOLID-STATE TELESCOPES, ALL LOOKING NORMAL TO THE SPACECRAFT SPIN AXIS. THE HIGH-ENERGY TELESCOPE (HET) CONSISTED OF FIVE COLINEAR SENSORS AND MEASURED STOPPING PARTICLES ( $Z = 1$  TO 8) IN THE ENERGY RANGE 20 TO 50 MEV/NUCLEON AND PENETRATING PARTICLES IN THE RANGE 50 TO 800 MEV/NUCLEON. CHARGE RESOLUTION FOR PENETRATING PARTICLES WAS POSSIBLE UP TO 200 MEV/NUCLEON. THE FIRST LOW-ENERGY TELESCOPE (LET-I) HAD FOUR ELEMENTS AND MEASURED STOPPING ( $Z = 1$  TO 8) PARTICLES IN THE ENERGY RANGE 3 TO 32 MEV/NUCLEON. THE SECOND LOW-ENERGY TELESCOPE (LET-II) HAD THREE ELEMENTS AND MEASURED STOPPING ELECTRONS BETWEEN 50 AND 1000 KEV AND STOPPING PROTONS BETWEEN 50 KEV AND 20 MEV. FOR EACH TELESCOPE, COUNT RATES WERE OBTAINED FOR EACH OF SEVERAL SENSOR COINCIDENCE-ANTICOINCIDENCE MODES. SOME OF THE RATES FROM EACH TELESCOPE WERE SECTORED INTO EIGHT OCTANTS IN THE SPACECRAFT SPIN PLANE. IN ADDITION, THREE-SENSOR PULSE HEIGHT ANALYSIS, WITH PRIORITY SCHEMES FAVORING THE ANALYSIS OF HEAVIER PARTICLES, WAS ASSOCIATED WITH EACH TELESCOPE.

**----- PIONEER 10, SIMPSON -----****INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION**

NSSDC ID- 72-012A-02	INVESTIGATIVE PROGRAM CODE SL
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INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

**PERSONNEL**

PI - J.A. SIMPSON	U OF CHICAGO
OI - J.J. O'GALLAGHER	U OF MARYLAND
OI - A. TUZZOLINO	U OF CHICAGO

**BRIEF DESCRIPTION**

THIS EXPERIMENT MEASURED CHARGED-PARTICLE COMPOSITION AND SPECTRA USING FOUR DETECTOR SYSTEMS: (1) THE MAIN TELESCOPE, CONSISTING OF SEVEN ELEMENTS AND PROVIDING ENERGY SPECTRA (APPROXIMATELY 3 TO 60 MEV FOR PROTONS AND 10 TO 150 MEV/N FOR OXYGEN), ELEMENT RESOLUTION (THROUGH OXYGEN), AND ISOTOPE RESOLUTION (FOR H AND HE); (2) THE LOW-ENERGY SUBSYSTEM TELESCOPE, CONSISTING OF TWO ELEMENTS AND USING A VERY SMALL THIN FIRST ELEMENT TO EXTEND THE HIGH-SENSITIVITY PROTON MEASUREMENTS BELOW 1 MEV (0.3 TO 9 MEV) IN THE PRESENCE OF A HIGH GAMMA-RAY BACKGROUND ABOARD THE SPACECRAFT; (3) THE ELECTRON-CURRENT DETECTOR (OR EGG), CONSISTING OF A BERYLLIUM-SHIELDED SILICON DETECTOR OPERATED IN CURRENT MODE TO MEASURE HIGH FLUXES OF ELECTRONS WITH ENERGIES ABOVE 3 MEV; AND (4) THE FISSION CELL DETECTOR, RECORDING FISSION FRAGMENTS FROM THE NUCLEON-INDUCED FISSION OF THORIUM 232 SANDWICHED BETWEEN TWO LARGE-AREA SILICON DETECTORS TO MEASURE FLUXES OF PROTONS (ABOVE 30 MEV) IN THE PRESENCE OF HIGH FLUXES OF ELECTRONS. THE EXPERIMENT SAMPLE TIME WAS SYNCHRONIZED WITH THE SPACECRAFT SPIN, PERMITTING SECTORING OF THE READOUT OF THE MAIN AND LOW-ENERGY TELESCOPES INTO EIGHT OCTANTS AROUND THE SPIN AXIS.

**----- PIONEER 10, VAN ALLEN -----****INVESTIGATION NAME- JOVIAN CHARGED PARTICLES**

NSSDC ID- 72-012A-11	INVESTIGATIVE PROGRAM CODE SL
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INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - J.A. VAN ALLEN	U OF IOWA
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**BRIEF DESCRIPTION**

THIS EXPERIMENT USED SEVEN MINIATURE GEIGER TUBES IN THREE ARRAYS TO MEASURE PROTON AND ELECTRON FLUXES IN INTERPLANETARY SPACE AND IN THE VICINITY OF JUPITER. DETECTOR GROUPINGS WERE AS FOLLOWS -- (1) A THREE-ELEMENT (A, B, AND C) DIFFERENTIALLY SHIELDED TELESCOPE, WITH TUBE C SHIELDED OMNIDIRECTIONALLY AND USED FOR BACKGROUND SUBTRACTION TO PROVIDE DIRECTIONAL RATES SUCH AS A-C (ELECTRONS OF 5-21 MEV AND PROTONS OF 30-77.5 MEV) AND B-C (ELECTRONS OF 0.55-21 MEV AND PROTONS OF 6.6-77.5 MEV). (2) A THREE-ELEMENT (D, E, AND F) TRIANGULAR ARRAY, EACH ELEMENT RESPONDING TO ELECTRONS ABOVE 31 MEV AND PROTONS ABOVE 77.5 MEV, AND (3) A THIN-WINDOW TUBE (G) WITH A GOLD-PLATED ELBOW AS THE APERTURE WHICH ADMITS SCATTERED ELECTRONS ABOVE 0.06 MEV WHILE DISCRIMINATING STRONGLY AGAINST PROTONS. SINGLE ELEMENT AND COINCIDENCE RATES WERE TELEMETERED FROM THE FIRST TWO TELESCOPES. THE TELEMETRY BIT RATE PREVAILING DURING THE JUPITER ENCOUNTER PERMITTED DIRECTIONAL SAMPLING IN INTERVALS OF ABOUT 14 DEG OF ROLL AROUND THE SPIN AXIS. FOR FURTHER DETAILS SEE BAKER AND VAN ALLEN, "J. GEOPHYS. RES.", 81, 617, 1976.

**----- PIONEER 10, WOLFE -----****INVESTIGATION NAME- PLASMA**

NSSDC ID- 72-012A-13	INVESTIGATIVE PROGRAM CODE SL/CO-OP
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INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - J.H. WOLFE	NASA-ARC
OI - L.A. FRANK	U OF IOWA
OI - R. LUST	MPI-HEADQUARTERS
OI - D.S. INTRILIGATOR	U OF SOUTHERN CALIF
OI - D.D. MCKIBBIN	NASA-ARC
OI - V.T. ZAVIENTSEFF	NASA-ARC
OI - F.L. SCARF	TRW SYSTEMS GROUP
OI - H.R. COLLARD	NASA-ARC
OI - W.C. FELDBAN	LOS ALAMOS SCI LAB
OI - Z.A. SMITH	NOAA-SEL

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTED OF DUAL 90 DEG QUADRISPERICAL ELECTROSTATIC ANALYZERS, ONE WITH 26 INDIVIDUAL PARTICLE DETECTORS AND THE OTHER WITH 5 CURRENT COLLECTORS. THE SYSTEM WAS CAPABLE OF MEASURING INCIDENT PLASMA DISTRIBUTION PARAMETERS OVER THE ENERGY RANGE OF 0.1 TO 18 KEV FOR PROTONS AND APPROXIMATELY 1-500 EV FOR ELECTRONS. THE HIGH RESOLUTION ANALYZER WITH A COUNTOUT OF 9 KEV/Q PER KV APPLIED TO THE

PLATES, HAD A MEAN PLATE RADIUS OF 9 CM AND SEPARATION OF 0.5 CM. THIS ANALYZER WAS USED TO MEASURE IONS ONLY AND HAD 26 CHANNELTRONS MOUNTED ON THE SEMICIRCULAR EXIT TO THE ANALYZER. THE APERTURE POINTED THROUGH A WIDE SLIT IN THE BACK OF THE SPACECRAFT. HIGH-GAIN ANTENNA REFLECTOR AND POINTED ALONG THE SPIN AXIS TOWARD THE EARTH (AND THEREFORE THE SUN). THE EDGES OF THE ANTENNA REFLECTOR LIMITED THE VIEWING OF THE INSTRUMENT TO 73 DEG WITH RESPECT TO THE SPIN AXIS. THE CHANNELTRONS COVERED A RANGE OF PLUS OR MINUS 51 DEG. EACH CHANNELTRON NEAR THE CENTER COVERED 3 DEG AND APPROXIMATELY 8 DEG NEAR THE EDGES OF THE ANALYZER. THE ANGULAR WIDTH PERPENDICULAR TO THE LONG ANGULAR WIDTH WAS ABOUT 2 DEG. IN ONE HALF A SPIN PERIOD THE WHOLE CONE OF HALF ANGLE 51 DEG CENTERED ON THE SUN WAS SWEEPED OUT. A MEDIUM ENERGY ANALYZER WITH A MEAN RADIUS OF 12 CM AND A 1 CM PLATE SEPARATION (CONSTANT OF 6 KEV/PER KV APPLIED) WAS USED TO DETECT BOTH IONS AND ELECTRONS. THE DETECTORS WERE FIVE FLAT-SURFACE CURRENT COLLECTORS. THE THREE CENTER COLLECTORS EACH COVERED 15 DEG AND COVERED THE ANGULAR RANGE OF PLUS OR MINUS 22.5 DEG FROM THE SPIN AXIS. THE TWO OUTSIDE COLLECTORS HAD AN ANGULAR WIDTH OF 47.5 DEG AND WERE LOCATED AT PLUS OR MINUS 46.25 DEG FROM THE CENTER OF THE ANALYZER. THERE WERE A VARIETY OF POSSIBLE OPERATING MODES FOR THE EXPERIMENTS; HOWEVER, THE PRINCIPAL MODE UTILIZED DURING THE ENCOUNTER PHASE WAS ONE IN WHICH THE ANALYZER PLATE POTENTIAL WAS STEPPED THROUGH ITS RANGE EVERY ONE-HALF REVOLUTION OF THE SPACECRAFT AND ALL CURRENT COLLECTORS OR CHANNELTRONS WERE READ OUT AT THE PEAK FLUX ROLL ANGLE. THE HIGH- AND MEDIUM-RESOLUTION ANALYZERS OPERATED INDEPENDENTLY SO A CROSS-CHECK BETWEEN THESE ANALYZERS WAS POSSIBLE. THE DYNAMIC RANGE FOR THE PARTICLE FLUXES WAS FROM  $1.0 \times 10^{-2}$  TO  $3.0 \times 10^{-9}/50$  CM<sup>-2</sup>S<sup>-1</sup> AND THE PROTON TEMPERATURE DOWN TO  $2.0 \times 10^{-3}$  DEG K COULD BE ASCERTAINED.

\* \* \* \* \* PIONEER 11 \* \* \* \* \*

SPACECRAFT COMMON NAME - PIONEER 11  
ALTERNATE NAMES - PIONEER-G, PL-733C  
6421

NSSDC ID - 73-019A

LAUNCH DATE - 04/06/73 WEIGHT - 231. KG  
LAUNCH SITE - CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE - ATLAS

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

INITIAL CRBIT PARAMETERS  
ORBIT TYPE - SATURN FLYBY

PERSONNEL  
MG - F.D. KOCHENDORFER NASA HEADQUARTERS  
SC - A.G. OPP NASA HEADQUARTERS  
PM - C.F. HALL NASA-ARC  
PS - J.H. WOLFE NASA-ARC

BRIEF DESCRIPTION  
THIS WAS THE SECOND MISSION TO INVESTIGATE JUPITER AND THE OUTER SOLAR SYSTEM. PIONEER 11, LIKE PIONEER 10, USED JUPITER'S GRAVITATIONAL FIELD TO ALTER ITS TRAJECTORY RADICALLY. IT PASSED CLOSE TO SATURN AND THEN AN ESCAPE TRAJECTORY FROM THE SOLAR SYSTEM WAS FOLLOWED. THE SPACECRAFT WAS 2.9-M (9.5-FT) LONG AND CONTAINED A 2.74-M (9-FT) DIAMETER HIGH-GAIN ANTENNA OF ALUMINUM HONEYCOMB SANDWICH MATERIAL WHOSE FEED WAS TOPPED WITH A MEDIUM-GAIN ANTENNA. A LOW-GAIN, OMNI-ANTENNA WAS MOUNTED BELOW THE HIGH-GAIN DISH. IT CONTAINED TWO NUCLEAR ELECTRIC-POWER GENERATORS, WHICH GENERATED 144 W AT JUPITER, BUT DECREASED TO 100 W AT SATURN. THERE WERE THREE REFERENCE SENSORS -- A STAR (CANOPUS) SENSOR, AND TWO SUN SENSORS. ATTITUDE POSITION COULD BE CALCULATED FROM THE REFERENCE DIRECTION TO EARTH AND THE SUN, WITH THE KNOWN DIRECTION TO CANOPUS AS BACKUP. PIONEER 11'S STAR SENSOR GAIN AND THRESHOLD SETTINGS WERE MODIFIED BASED ON EXPERIENCE FROM THAT OF PIONEER 10. THREE PAIRS OF ROCKET THRUSTERS PROVIDED SPIN AXIS CONTROL (AT 4.8 RPM) AND CHANGE OF THE SPACECRAFT VELOCITY. THE THRUSTERS COULD BE FIRED STEADILY OR PULSED, BY COMMAND. COMMUNICATIONS WERE MAINTAINED VIA THE OMNI- AND MEDIUM-GAIN ANTENNAS, WHICH OPERATED TOGETHER, CONNECTED TO ONE RECEIVER, WHILE THE HIGH-GAIN ANTENNA WAS CONNECTED TO THE OTHER RECEIVER. THE RECEIVERS COULD BE INTERCHANGED BY COMMAND. TWO RADIO TRANSMITTERS, COUPLED TO TWO TRAVELING WAVE TUBE AMPLIFIERS, PRODUCED 8 W POWER EACH IN S-BAND. COMMUNICATION UPLINK (EARTH TO SPACECRAFT) OPERATED AT 2110 MHZ, AND DOWNLINK (SPACECRAFT TO EARTH) AT 2292 MHZ. AT JUPITER'S DISTANCE, ROUND-TRIP COMMUNICATION TIME TOOK 92 MIN. DATA WERE RECEIVED AT THE DEEP SPACE NETWORK. THE SPACECRAFT WAS TEMPERATURE-CONTROLLED TO BETWEEN -23 AND +58 DEG C (-10 TO +100 DEG F). AN ADDITIONAL EXPERIMENT, A LOW SENSITIVITY FLUXGATE MAGNETOMETER, WAS ADDED TO THE PIONEER 11 PAYLOAD. INSTRUMENTS STUDIED THE INTERPLANETARY AND PLANETARY MAGNETIC FIELDS; SOLAR WIND PROPERTIES; COSMIC RAYS; TRANSITION REGION OF THE HELIOSPHERE; NEUTRAL HYDROGEN ABUNDANCE; DISTRIBUTION, SIZE, MASS, FLUX, AND VELOCITY OF DUST PARTICLES; JOVIAN AURORAE; JOVIAN RADIO WAVES; PLANETS' AND SATELLITES' ATMOSPHERES AND SURFACES OF JUPITER, SATURN, AND SOME OF THEIR SATELLITES. EQUIPMENT CARRIED FOR THESE EXPERIMENTS WERE -- MAGNETOMETER, PLASMA ANALYZER (FOR SOLAR WIND), CHARGED PARTICLE DETECTOR, IONIZING DETECTOR, NON-IMAGING TELESCOPES WITH OVERLAPPING FIELDS OF VIEW TO DETECT SUNLIGHT REFLECTED FROM PASSING METEOROIDS, SEALED PRESSURIZED CELLS OF ARGON AND NITROGEN GAS FOR MEASURING PENETRATION OF METEOROIDS, UV PHOTOMETER, IR RADIOMETER, AND AN IMAGING PHOTOPOLARIMETER, WHICH PRODUCED PHOTOGRAPHS AS WELL AS MEASURING THE

POLARIZATION. FURTHER SCIENTIFIC INFORMATION WAS OBTAINED FROM THE CELESTIAL MECHANICS AND OCCULTATION PHENOMENA. THIS SPACECRAFT, LIKE PIONEER 10, CONTAINED PLAQUES THAT HAD DRAWINGS DEPICTING MAN, WOMAN, AND LOCATION OF THE SUN AND EARTH IN THE GALAXY. PIONEER 11 WAS 36,800 KM FROM JUPITER DURING ITS CLOSEST APPROACH. IT PASSED BY SATURN AUG. 5, 1979.

----- PIONEER 11, ACUNA -----

INVESTIGATION NAME - JOVIAN MAGNETIC FIELD

NSSDC ID - 73-019A-14 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PLANETARY MAGNETIC FIELD

PERSONNEL

PI - M.H. ACUNA  
OI - N.F. RESS

NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS INSTRUMENT, DESIGNED TO MEASURE THE JOVIAN AND SATURNIAN MAGNETIC FIELD, CONSISTED OF A SINGLE-RANGE TRIAXIAL FLUXGATE MAGNETOMETER SENSOR AND ASSOCIATED ELECTRONICS CAPABLE OF MEASURING FIELDS FROM  $1.0 \times 10^{-6}$  TO  $1.0 \times 10^{-3}$  T (0.01 TO 10 GAUSS) ALONG EACH ORTHOGONAL AXIS. INSTANTANEOUS VECTOR MEASUREMENTS, USING A 10-BIT A-TO-D CONVERTER, YIELDED A QUANTIZATION STEP SIZE OF MINUS 600 NT TO PLUS 600 NT FOR FIELDS LESS THAN  $2.0 \times 10^{-4}$  T. THESE ARE MADE ONCE EVERY THREE REVOLUTIONS OF THE SPACECRAFT (36 S) AND TRANSMITTED TO THE GROUND WITH NO FURTHER ON-BOARD PROCESSING. MORE INSTRUMENTAL DETAILS ARE GIVEN IN 'SP. SCI. INSTRUM.', 1, 177, 1975. PRINCIPAL JOVIAN SCIENTIFIC RESULTS CAN BE FOUND IN 'JGR' 81, 2917, 1976.

----- PIONEER 11, ANDERSON -----

INVESTIGATION NAME - CELESTIAL MECHANICS

NSSDC ID - 73-019A-09 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
ASTRONOMY  
CELESTIAL MECHANICS

PERSONNEL

PI - J.D. ANDERSON  
OI - G.W. NULL

NASA-JPL  
NASA-JPL

BRIEF DESCRIPTION

TWO-WAY DOPPLER TRACKING OF THE SPACECRAFT WAS USED TO MAKE MORE PRECISE DETERMINATIONS OF PLANETARY MASSES, THE HELIOCENTRIC ORBITS OF JUPITER AND SATURN, AND THE GRAVITATIONAL FIELDS OF THE SUN, JUPITER, SATURN, AND THE GALILEAN AND SATURNIAN SATELLITES.

----- PIONEER 11, FILLIUS -----

INVESTIGATION NAME - JOVIAN TRAPPED RADIATION

NSSDC ID - 73-019A-05 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
PLANETOLOGY

PERSONNEL

PI - R.W. FILLIUS  
OI - C.E. MCILWAIN

U OF CALIF, SAN DIEGO  
U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF AN ARRAY OF FIVE PARTICLE DETECTORS WITH ELECTRON THRESHOLDS IN THE RANGE .01 TO 15 MEV AND PROTON THRESHOLDS IN THE RANGE 0.15 TO 80 MEV. A CERENKOV COUNTER (C) HAD FOUR OUTPUT CHANNELS (C1, C2, C3, AND CDC) SENSITIVE TO ELECTRONS HAVING ENERGIES ABOVE 5-, 8-, 12-, AND 1 MEV, RESPECTIVELY. AN ELECTRON SCATTER COUNTER (E) HAD THREE OUTPUT CHANNELS (E1, E2, AND E3) SENSITIVE TO ELECTRONS ABOVE .16-, .26-, AND .46 MEV. A MINIMUM IONIZATION COUNTER (M) HAD THREE OUTPUT CHANNELS, M1 SENSITIVE TO ELECTRONS HAVING ENERGIES GREATER THAN 35 MEV, M2 THAT MEASURED BACKGROUND, AND M3 THAT WAS SENSITIVE TO PROTONS HAVING ENERGIES GREATER THAN 60 MEV. THE LAST TWO SENSORS WERE SCINTILLATOR DETECTORS (SP AND SE), BOTH OF WHICH HAD ENERGY THRESHOLDS OF 10 KEV FOR ELECTRONS AND 150 KEV FOR PROTONS. THE SENSITIVITY OF THE SE DETECTOR TO PROTONS WAS ABOUT A FACTOR OF 10 LOWER THAN ITS SENSITIVITY TO ELECTRONS. THUS, THE SE/DE CHANNEL EFFECTIVELY MEASURED THE ELECTRON FLUX, WHICH COULD THEN BE SUBTRACTED FROM THE SP/DE CHANNEL RESPONSE TO OBTAIN THE PROTON FLUX. SEVERAL OTHER CHANNELS LISTED ABOVE REQUIRED CORRECTIONS TO OBTAIN THE FLUXES OF THE SPECIES INDICATED. THE DETECTOR CHANNELS COULD BE PROGRAMMED FOR READ-OUT IN ANY ONE OF FOUR PATTERNS AT EACH OF THE EIGHT SPACECRAFT BIT RATE MODES. DURING ENCOUNTER WHEN THE SPACECRAFT WAS OPERATING IN THE HIGHEST BIT RATE MODE, THE MINIMUM TIME TO SAMPLE ONE CHANNEL WAS 1.5 S AND THE TIME TO OBTAIN A COMPLETE SCAN THROUGH ALL CHANNELS WAS 10K S. SINCE THE DIRECTIONAL DETECTORS POINTED PERPENDICULAR TO THE SPIN AXIS AND THE SPIN RATE WAS 5 RPM, PITCH ANGLE MEASUREMENTS WERE OBTAINED WHILE THIS EXPERIMENT WAS PRIMARILY DESIGNED FOR

ENCOUNTER STUDIES. SOME DATA WERE OBTAINED AT LOW RATES IN INTERPLANETARY SPACE. A DESCRIPTION OF THE INSTRUMENTATION AND INITIAL PIONEER 10 RESULTS WAS PUBLISHED IN JGR, 79, 3589, 1974.

----- PIONEER 11, GEHRELS -----

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 73-019A-07 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

PI - T. GEHRELS	U OF ARIZONA
OI - D.L. COFFEEN	NASA-GISS
OI - J. HAMEEN-ANTTILA	U OF ARIZONA
OI - C.E. KENKNIGHT	U OF ARIZONA
OI - R.F. HUMMER	SANTA BARBARA RES CTR
OI - M.G. TONASCO	U OF ARIZONA
OI - W. SWINDELL	U OF ARIZONA

BRIEF DESCRIPTION

THE IMAGING PHOTOPOLARIMETER (IPP) EXPERIMENT USED DURING JOVIAN AND SATURNIAN ENCOUNTER MADE SIMULTANEOUSLY TWO COLOR (BLUE - 3900 TO 4900 Å, RED - 5800 TO 7000 Å) POLARIMETRIC AND RADIOMETRIC MEASUREMENTS, AND MODERATE RESOLUTION (ABOUT 200 KP AT BEST) SPIN-SCAN IMAGES OF JUPITER AND THE JOVIAN SATELLITES AND SATURN AND SOME OF ITS SATELLITES. THE POLARIMETRIC AND RADIOMETRIC WORK WAS PERFORMED USING AN 8- BY 8-MM-RAD FIELD-STOP APERTURE, WHILE THE SPIN-SCAN IMAGING USED A 0.5- BY 0.5-MM-RAD APERTURE STOP. RELATIVE RADIOMETRIC CALIBRATION WAS DERIVED USING AN INTERNAL TUNGSTEN LAMP. LONG-TERM ABSOLUTE CALIBRATION OF THE INSTRUMENT WAS ACCOMPLISHED BY MEANS OF A SUNLIGHT DIFFUSOR/ATTENUATOR ELEMENT LOCATED IN THE SPACECRAFT ANTENNA STRUCTURE. PRIMARY RADIOMETRIC CALIBRATION WAS OBTAINED THROUGHOUT THE MISSION BY PERIODICALLY COMMANDING THE TELESCOPE TO VIEW THIS DIFFUSE BACKLITTED (SUNLIGHT) SOURCE. THE EXPERIMENTAL TRAIN FOR THE IPP PACKAGE CONSISTED OF THE FOLLOWING ELEMENTS -- (1) A NEAR-DIFFRACTION-LIMITED 2.54-CM MAKUTOV TELESCOPE OF FOCAL RATIO F/3.4, (2) A FOCAL PLANE WHEEL CONTAINING FOV APERTURES, DEPOLARIZERS, CALIBRATION SOURCE, ETC., (3) A WOLLASTON PRISM TO SPLIT THE LIGHT INTO TWO ORTHOGONALLY POLARIZED BEAMS, (4) A 45-DEG DICHROMATIC MIRROR THAT REFLECTS WAVELENGTHS OF LESS THAN 5500 Å (BLUE BEAM) AND TRANSMITS ALL LIGHT OF GREATER WAVELENGTH (RED BEAM), (5) FOR EACH SPECTRAL BEAM TWO BENDIX CHANNELTRON (BLUE - BIALKALI S-11 PHOTOCATHODES, RED - S-20) PHOTOCATHODES TO REGISTER THE INTENSITY IN EACH POLARIZATION COMPONENT.

----- PIONEER 11, INGERSOLL -----

INVESTIGATION NAME- INFRARED RADIOMETER

NSSDC ID- 73-019A-08 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

PI - A.P. INGERSOLL	CALIF INST OF TECH
OI - R.W. BOESE	NASA-ARC
OI - S.C. CHASE, JR.	SANTA BARBARA RES CTR
OI - G. NEUGEBAUER	CALIF INST OF TECH
OI - L.M. TRAFFON	U OF TEXAS, AUSTIN

BRIEF DESCRIPTION

THE PIONEER 11 INFRARED RADIOMETER EXPERIMENT MEASURED THE JOVIAN AND SATURNIAN THERMAL BALANCE, TEMPERATURE DISTRIBUTION IN THE OUTER ATMOSPHERE, GENERAL SURFACE COMPOSITION, INCLUDING THE OVERALL HYDROGEN-TO-HELUM RATIO, AND DARK SIDE TEMPERATURE. THE INSTRUMENT CONSISTED OF A 7.62-CM (3-IN.) REFLECTING CASSEGRAIN TELESCOPE WITH A 1-DEG BY 3-DEG FIELD-OF-VIEW THAT ILLUMINATES A PAIR OF BB-CHANNEL, THIN-FILM BIMETALLIC THERMOPILES IN TWO BANDS OF THE IR SPECTRUM (14 TO 25 MICROMETERS AND 19 TO 56 MICROMETERS) TO MEASURE THE IRRADIANCE. THE TWO-CHANNEL RADIOMETER WAS SIMILAR TO THOSE FLOWN ON MARINER 6 AND 7, BUT WAS MORE ACCURATE AND HAD BETTER SPATIAL RESOLUTION.

----- PIONEER 11, JUDGE -----

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 73-019A-06 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
PLANETARY ATMOSPHERES  
PLANETOLOGY  
PARTICLES AND FIELDS

PERSONNEL

PI - D.L. JUDGE  
OI - R.W. CARLSON

U OF SOUTHERN CALIF  
NASA-JPL

BRIEF DESCRIPTION

THIS EXPERIMENT, A BROADBAND PHOTOMETER SENSITIVE BETWEEN 200 AND 800 Å, OBSERVED EVIDENCE OF HELIUM WHICH IN TURN INDICATED INTERACTIONS BETWEEN CHARGED PARTICLES AND NEUTRAL HYDROGEN. DURING THE CRUISE PHASE OF THE MISSION, THIS EXPERIMENT WAS USED TO SEARCH FOR THE SUPERSONIC TO SUBSONIC TRANSITION REGION IN THE SOLAR WIND. DURING THE JOVIAN ENCOUNTER, THIS EXPERIMENT WAS USED TO LOOK FOR EVIDENCE OF AN AURORAL OVAL ON THE JOVIAN DAYSIDE, TO FIND THE RATIO OF HYDROGEN TO HELIUM IN THE JOVIAN ATMOSPHERE, AND TO FIND THE TEMPERATURE OF THE OUTER PORTION OF THE JOVIAN ATMOSPHERE.

----- PIONEER 11, KINARD -----

INVESTIGATION NAME- METEOROID DETECTORS

NSSDC ID- 73-019A-04

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
INTERPLANETARY DUST

PERSONNEL

PI - W.H. KINARD  
OI - J.M. ALVAREZ  
OI - D.H. MURRES

NASA-LARC  
NASA-LARC  
NASA-LARC

BRIEF DESCRIPTION

THE PIONEER 11 METEOROID DETECTION EXPERIMENT ATTEMPTED TO DETECT THE DISTRIBUTION IN INTERPLANETARY SPACE OF METEOROIDS TOO SMALL TO BE SEEN BY LIGHT-SCATTERING TECHNIQUES. TWELVE PANELS, EACH CONTAINING 16 PRESSURIZED CELLS, WERE MOUNTED ON THE BACK OF THE SPACECRAFT ANTENNA DISH. THE PRESSURIZED CELLS CONSISTED OF A 5.08E-5 M THICK STAINLESS STEEL OUTER LAYER WELDED TO A 2.54E-5 M THICK STAINLESS STEEL INNER LAYER WITH A LARGE NUMBER OF SMALL POCKETS OF GAS TRAPPED BETWEEN THEM. LOSS OF GAS PRESSURE FROM ANY OF THE CELLS INDICATED A HIT, AND THE RATE OF GAS LOSS INDICATED THE SIZE OF THE HOLE MADE. THUS THE MASS AND INCIDENT ENERGY OF THE METEOROID PARTICLE COULD BE OBTAINED, AND WHEN COMBINED WITH THE TRAJECTORY DATA, ALLOWED THE SPATIAL DENSITY OF THE METEOROIDS TO BE DETERMINED. THE PANELS DETECTED IMPACTS WITH PARTICLES HAVING A MASS OF GREATER THAN 1.E-8 G. THE PANELS COVERED 0.4656 M<sup>2</sup> OF EXPOSED AREA ON PIONEER 11. RESULTS FROM THIS EXPERIMENT WERE COMBINED WITH THOSE FROM A SIMILAR EXPERIMENT FLOWN ON PIONEER 10 TO DETERMINE THE RANGE IN MASS OF SMALL PARTICLES ON BOTH THE INNER AND OUTER BOUNDARIES AND WITHIN THE ASTEROID BELT.

----- PIONEER 11, KLIRORE -----

INVESTIGATION NAME- S-BAND OCCULTATION

NSSDC ID- 73-019A-10

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J. KLIRORE  
OI - G. FJELDRO  
OI - D.L. CAIN  
OI - D.L. SEIDEL  
OI - S.I. RASOOL

NASA-JPL  
NASA-JPL  
NASA-JPL  
NASA-JPL  
NASA HEADQUARTERS

BRIEF DESCRIPTION

THIS EXPERIMENT UTILIZED THE S-BAND (2292 MHZ, 8 W) SPACECRAFT RADIO TRANSMITTER SIGNAL CHARACTERISTICS TO OBTAIN INFORMATION ABOUT THE IONOSPHERES AND ATMOSPHERES OF JUPITER AND ITS SATELLITE IO, AND SATURN ENTRANCE INTO AND EXIT FROM JUPITER AND IO OCCULTATION. PROVIDED CHANGES IN THE SIGNAL CHARACTERISTICS FROM WHICH ATMOSPHERIC TEMPERATURE, PRESSURE, AND ELECTRON DENSITY PROFILES COULD BE CALCULATED. TEMPERATURE AND PRESSURE PROFILES WERE LIMITED TO LEVELS ABOVE THE PRESSURE OF ONE EARTH ATMOSPHERE. SIGNAL OCCULTATION ALSO PROVIDED A DETERMINATION OF THE PLANETARY DIAMETER.

----- PIONEER 11, McDONALD -----

INVESTIGATION NAME- COSMIC-RAY SPECTRA

NSSDC ID- 73-019A-12

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - F.B. McDONALD  
OI - K.G. MCCRACKEN  
OI - W.R. WEBBER  
OI - E.C. RODELOF  
OI - B.J. TEEGARDEN  
OI - J.H. TRAINOR

NASA-GSFC  
CSIRO  
U OF NEW HAMPSHIRE  
APPLIED PHYSICS LAB  
NASA-GSFC  
NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF THREE 3-ELEMENT TELESCOPES, ALL LOOKING NORMAL TO THE SPACECRAFT SPIN AXIS. A BIREDIRECTIONAL TELESCOPE MEASURED 20- TO 800-MEV/NUCLEON PARTICLES WITH 5 TO 10 PERCENT ENERGY RESOLUTION. ANOTHER TELESCOPE MEASURED 3- TO 22-MEV/NUCLEON PARTICLES WITH 5 PERCENT RESOLUTION. THESE TWO TELESCOPES MEASURED PARTICLES WITH Z VALUES BETWEEN 1 AND 8. THE THIRD TELESCOPE MEASURED 50-MEV TO 1-MEV ELECTRONS AND 50-MEV TO 20-MEV PROTONS WITH 20 PERCENT RESOLUTION.

----- PIONEER 11, SIMPSON -----

INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION

NSSDC ID- 73-019A-02

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
CCSPIC RAYS**PERSONNEL**

PI - J.A. SIMPSON	U OF CHICAGO
OI - J.J. O'GALLAGHER	U OF MARYLAND
OI - A. TUZZOLINO	U OF CHICAGO

**BRIEF DESCRIPTION**

THIS EXPERIMENT USED TWO TELESCOPES TO MEASURE THE COMPOSITION AND ENERGY SPECTRA OF SOLAR (AND GALACTIC) PARTICLES ABOVE ABOUT 0.5 MEV/NUCLEON. THE MAIN TELESCOPE CONSISTED OF FIVE COLLINEAR ELEMENTS (THREE SOLID STATE, ONE CISI, AND ONE SAPPHIRE CERENKOV) SURROUNDED BY A PLASTIC ANTICOINCIDENCE SHIELD. THE TELESCOPE HAD A 60-DEG, FULL-ANGLE ACCEPTANCE CONE WITH ITS AXIS APPROXIMATELY NORMAL TO THE SPACECRAFT SPIN AXIS PERMITTING 8-SECTORED INFORMATION ON PARTICLE ARRIVAL DIRECTION. FOUR ELEMENTS OF THE MAIN TELESCOPE WERE PULSE-HEIGHT ANALYZED, AND LOW- AND HIGH-GAIN MODES COULD BE SELECTED BY COMMAND TO PERMIT RESOLUTION OF THE ELEMENTS H THROUGH Ni OR OF THE ELECTRONS AND THE ISOTOPES OF H AND He AND LIGHT NUCLEI. A SELECTION-PRIORITY SCHEME WAS INCLUDED TO PERMIT SAMPLING OF LESS ABUNDANT PARTICLE SPECIES UNDER NORMAL AND SOLAR-FLARE CONDITIONS. THE LOW-ENERGY TELESCOPE WAS ESSENTIALLY A TWO-ELEMENT, SHIELDED, SOLID-STATE DETECTOR WITH A 70-DEG, FULL-ANGLE ACCEPTANCE CONE. THE FIRST ELEMENT WAS PULSE-HEIGHT ANALYZED, AND DATA WERE RECORDED BY SECTORS.

----- PIONEER 11, SMITH -----

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 73-019A-01

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PLANETARY MAGNETIC FIELD  
PARTICLES AND FIELDS**PERSONNEL**

PI - E.J. SMITH	NASA-JPL
OI - D.S. COLBURN	NASA-ARC
OI - P. DYAL	NASA-ARC
OI - C.P. SONETT	U OF ARIZONA
OI - P.J. COLEMAN, JR.	U OF CALIF., LA
OI - L. DAVIS, JR.	CALIF INST OF TECH
OI - D.E. JONES	BRIGHAM YOUNG U

**BRIEF DESCRIPTION**

THE MAGNETOMETER ON PIONEER 11 WAS A TRIAXIAL HELIUM MAGNETOMETER WITH SEVEN DYNAMIC RANGES, FROM PLUS OR MINUS 2.5 NT TO PLUS OR MINUS 1.0E-3 T. THE LINEARITY WAS 0.1 PERCENT. THE NOISE THRESHOLD WAS 0.01 NT RMS FOR 0-1 Hz. THE ACCURACY WAS 0.5 PERCENT OF FULL SCALE RANGE. THE EXPERIMENTER USED RTN COORDINATES IN HIS DATA ANALYSIS. IN THIS SYSTEM, R (OR X) IS RADIALLY OUTWARD FROM THE SUN, T (OR Y) WAS PARALLEL TO THE SUN'S EQUATORIAL PLANE AND HAD ITS DIRECTION GIVEN BY THE CROSS PRODUCT OF THE SUN'S SPIN VECTOR INTO THE RADIAL DIRECTION (I.E., INTO R) AND N (OR Z) COMPLETED THE RIGHT HANDED ORTHOGONAL SYSTEM (POSITIVE NORTHWARD). A DETAILED INSTRUMENT DESCRIPTION MAY BE FOUND IN SMITH ET AL., "IEEE TRANS. ON MAGNETICS," VOL. M-11, P 962, JULY 1975.

----- PIONEER 11, VAN ALLEN -----

INVESTIGATION NAME- JOVIAN CHARGED PARTICLES

NSSDC ID- 73-019A-11

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS**PERSONNEL**

PI - J.A. VAN ALLEN	U OF IOWA
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**BRIEF DESCRIPTION**

THIS EXPERIMENT USED SEVEN MINIATURE GEIGER TUBES IN THREE ARRAYS TO MEASURE PROTON AND ELECTRON FLUXES NEAR JUPITER AND SATURN. DETECTOR GROUPINGS ARE AS FOLLOWS -- (1) A THREE-ELEMENT (A, B AND C) DIFFERENTIALLY SHIELDED TELESCOPE. TUBE C IS SHIELDED OMNIDIRECTIONALLY AND IS USED FOR BACKGROUND SUBTRACTION TO PROVIDE RATES SUCH AS A-C (ELECTRONS OF 5 TO 21 MEV AND PROTONS OF 30 TO 77.5 MEV) AND B-C (ELECTRONS OF 0.55 TO 21 MEV AND PROTONS OF 6.6 TO 77.5 MEV), (2) A THREE-ELEMENT TRIANGULAR ARRAY, EACH ELEMENT RESPONDING TO ELECTRONS ABOVE 31 MEV AND PROTONS ABOVE 77.5 MEV, (3) A THIN-WINDOW TUBE (G) WITH A GOLD-PLATED ELBOW AS THE ENTRANCE APERTURE TO ADMIT SCATTERED ELECTRONS ABOVE 0.06 MEV WHILE DISCRIMINATING STRONGLY AGAINST PROTONS. FOR A DESCRIPTION OF THE SIMILAR EXPERIMENT ON PIONEER 10 SEE VAN ALLEN ET AL., JGR, 79, 3395, 1974. EARLY RESULTS ARE GIVEN IN SCIENCE, 198, 459, 1975.

----- PIONEER 11, WOLFE -----

INVESTIGATION NAME- PLASMA

NSSDC ID- 73-019A-13

INVESTIGATIVE PROGRAM  
CODE SL/CO-OPINVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS**PERSONNEL**

PI - J.H. WOLFE	NASA-ARC
OI - L.A. FRANK	U OF IOWA
OI - R. LUST	RPI-HEADQUARTERS
OI - B.S. INTRILIGATOR	U OF SOUTHERN CALIF
OI - V.T. ZAVIENSTEIN	NASA-ARC
OI - Z.A. SMITH	NOAA-SEL
OI - F.L. SCARF	TRW SYSTEMS GROUP
OI - H.B. COLLARD	NASA-ARC
OI - M.C. FELDMAN	LOS ALAMOS SCI LAB
OI - D.D. MCKIBBIN	NASA-ARC

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTED OF DUAL 40 DEG QUADRISpherical ELECTROSTATIC ANALYZERS, ONE WITH 26 INDIVIDUAL PARTICLE DETECTORS AND THE OTHER WITH 5 CURRENT COLLECTORS. THE SYSTEM WAS CAPABLE OF MEASURING INCIDENT PLASMA DISTRIBUTION PARAMETERS OVER THE ENERGY RANGE OF 0.1 TO 18 KEV FOR PROTONS AND APPROXIMATELY 1-500 EV FOR ELECTRONS. THE HIGH RESOLUTION ANALYZER WITH A COUNTOUT OF 9 KEV/PER KV APPLIED TO THE PLATES, HAD A MEAN PLATE RADIUS OF 9 CM AND SEPARATION OF 0.5 CM. THIS ANALYZER WAS USED TO MEASURE IONS ONLY AND HAD 26 CHANNELTRONS MOUNTED ON THE SEMICIRCULAR EXIT TO THE ANALYZER. THE APERTURE POINTED THROUGH A WIDE SLIT IN THE BACK OF THE SPACECRAFT HIGH-GAIN ANTENNA REFLECTOR AND POINTED ALONG THE SPIN AXIS TOWARD THE EARTH (AND THEREFORE THE SUN). THE EDGES OF THE ANTENNA REFLECTOR LIMITED THE VIEWING OF THE INSTRUMENT TO 73 DEG WITH RESPECT TO THE SPIN AXIS. THE CHANNELTRONS COVERED A RANGE OF PLUS OR MINUS 51 DEG. EACH CHANNELTRON NEAR THE CENTER COVERED 3 DEG AND APPROXIMATELY 8 DEG NEAR THE EDGES OF THE ANALYZER. THE ANGULAR WIDTH PERPENDICULAR TO THE LONG ANGULAR WIDTH WAS ABOUT 2 DEG. IN ONE HALF A SPIN PERIOD THE WHOLE CONE OF HALF ANGLE 51 DEG CENTERED ON THE SUN WAS SWEEPED OUT. A MEDIUM ENERGY ANALYZER WITH A MEAN RADIUS OF 12 CM AND A 1 CM PLATE SEPARATION (CONSTANT OF 6 KEV/Q PER KV APPLIED) WAS USED TO DETECT BOTH IONS AND ELECTRONS. THE DETECTORS WERE FIVE FLAT-SURFACE CURRENT COLLECTORS. THE THREE CENTER COLLECTORS EACH COVERED 15 DEG AND COVERED THE ANGULAR RANGE OF PLUS OR MINUS 22.5 DEG FROM THE SPIN AXIS. THE TWO OUTSIDE COLLECTORS HAD AN ANGULAR WIDTH OF 47.5 DEG AND WERE LOCATED AT PLUS OR MINUS 46.25 DEG FROM THE CENTER OF THE ANALYZER. THERE WERE A VARIETY OF POSSIBLE OPERATING MODES FOR THE EXPERIMENT; HOWEVER, THE PRINCIPAL MODE UTILIZED DURING THE ENCOUNTER PHASE WAS ONE IN WHICH THE ANALYZER PLATE POTENTIAL WAS STEPPED THROUGH ITS RANGE EVERY ONE-HALF REVOLUTION OF THE SPACECRAFT AND ALL CURRENT COLLECTORS OR CHANNELTRONS WERE READ OUT AT THE PEAK FLUX ROLL ANGLE. THE HIGH AND MEDIUM RESOLUTION ANALYZERS OPERATED INDEPENDENTLY SO A CROSS CHECK BETWEEN THESE ANALYZERS WAS POSSIBLE. THE DYNAMIC RANGE FOR THE PARTICLE FLUXES WAS FROM 1.0E+2 TO 3.0E+9/SQ CM-S AND THE PROTON TEMPERATURE DOWN TO 2.0E+3 DEG K COULD BE ASCERTAINED.

\*\*\*\*\* PIONEER VENUS 1 \*\*\*\*\*

SPACECRAFT COMMON NAME- PIONEER VENUS 1  
ALTERNATE NAMES- PIONEER VENUS 1978 ORBIT, 10911  
PIONEER VENUS ORBITER

NSSDC ID- 78-051A

LAUNCH DATE- 05/20/78  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- ATLAS-CENTSPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSOINITIAL ORBIT PARAMETERS  
ORBIT TYPE- VENUS ORBITER  
ORBIT PERIOD- 1440. MIN  
PERIAPSIS- 200. KM ALT  
EPOCH DATE- 12/04/78  
INCLINATION- 105. DEG  
APOAPSIS- 66614. KM ALT

**PERSONNEL**

MG - F.B. KOCHENDORFER	NASA HEADQUARTERS
SC - R.E. MURPHY	NASA HEADQUARTERS
PM - C.F. HALL	NASA-ARC
PS - L. COLIN	NASA-ARC

**BRIEF DESCRIPTION**

PIONEER VENUS 1 WAS THE FIRST OF TWO MISSIONS DESIGNED TO CONDUCT A COMPREHENSIVE INVESTIGATION OF VENUS' ATMOSPHERE. THE SPACECRAFT WAS A SOLAR-POWERED CYLINDER ABOUT 200 CM IN DIAMETER WHOSE SPIN AXIS WAS SPIN-STABILIZED PERPENDICULAR TO THE ECLiptIC PLANE. A HIGH-GAIN ANTENNA WAS MECHANICALLY DESPUN TO REMAIN FOCUSED ON THE EARTH. THE INSTRUMENTS WERE MOUNTED ON A SHELF WITHIN THE SPACECRAFT EXCEPT FOR A MAGNETOMETER MOUNTED AT THE END OF A BOOM TO INSURE AGAINST MAGNETIC INTERFERENCE FROM THE SPACECRAFT. PIONEER VENUS 1 WAS TO MEASURE THE DETAILED STRUCTURE OF VENUS' UPPER ATMOSPHERE AND IONOSPHERE, INVESTIGATE THE INTERACTION OF THE SOLAR WIND WITH VENUS' IONOSPHERE AND THE MAGNETIC FIELD IN THE VICINITY OF THE PLANET, DETERMINE THE CHARACTERISTICS OF THE ATMOSPHERE AND SURFACE OF VENUS ON A PLANETARY SCALE, DETERMINE THE PLANET'S GRAVITATIONAL FIELD HARMONICS FROM PERTURBATIONS OF THE SPACECRAFT ORBIT, AND DETECT GAMMA-RAY BURSTS.

**----- PIONEER VENUS 1, BRACE-----**

**INVESTIGATION NAME-** LANGMUIR PROBE

**NSSDC ID-** 78-051A-01

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
PLANETARY IONOSPHERES

**PERSONNEL**

PI - L.H. BRACE	NASA-GSFC
OI - M.B. MCELROY	HARVARD U
OI - A. PEDERSEN	ESA-ESTEC
OI - A.F. NAGY	U OF MICHIGAN
OI - T.M. DONAHUE	U OF MICHIGAN

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF A PAIR OF CYLINDRICAL LANGMUIR PROBES OF THE TYPE BEING USED ON AE. TWO PROBES WERE REQUIRED, SO THAT ONE WAS ALWAYS OUT OF THE WAKE OF THE SPACECRAFT. IN FLIGHT ANALYSIS, 56 MEASUREMENTS TAKEN AT A RATE OF ONE PER SECOND PROVIDED HIGH SPATIAL RESOLUTION FOR THE MEASUREMENTS OF NE AND TE. THE RESULTS OF THESE HIGH-RESOLUTION MEASUREMENTS WERE USED BOTH TO STUDY THE UPPER ATMOSPHERE AND IONOSPHERE AND TO INVESTIGATE THE INTERACTION OF THE SOLAR WIND WITH THE VENUSIAN IONOSPHERE. THIS EXPERIMENT PROVIDED MEASUREMENTS OVER THE WHOLE REGION TRAVESED BY THE ORBITER, COVERING A LARGE RANGE OF SOLAR ASPECT ANGLES, TO YIELD A MORE COMPLETE CONFIGURATION OF THE PHYSICAL PROPERTIES OF THE IONOPAUSE REGION.

**----- PIONEER VENUS 1, CROFT-----**

**INVESTIGATION NAME-** RADIO SCIENCE TEAM

**NSSDC ID-** 78-051A-03

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
GEODESY AND CARTOGRAPHY  
PLANETARY IONOSPHERES  
PLANETARY ATMOSPHERES

**PERSONNEL**

TL - T.A. CROFT	SRI INTERNATIONAL
TM - G.M. KEATING	NASA-LARC
TM - A.J. KLIORE	NASA-JPL
TM - R. PHILLIPS	NASA-JPL
TM - J.I. SHAPIRO	MASS INST OF TECH
TM - R. WOO	NASA-JPL

**BRIEF DESCRIPTION**

THE RADIO SCIENCE TEAM HAD THE RESPONSIBILITY FOR PLANNING, COORDINATING, AND RECOMMENDING SCIENTIFIC USES OF RADIO SIGNALS, EXECUTING APPROVED EXPERIMENTS, AND CONDUCTING THE DATA ANALYSIS REQUIRED. MAJOR FIELDS OF INTEREST INCLUDED THE GRAVITY FIELD OF VENUS, VERTICAL STRUCTURE OF THE DAYTIME AND NIGHTTIME IONOSPHERES, NEUTRAL ATMOSPHERE TEMPERATURE, PRESSURE AND DENSITY, HORIZONTAL GRADIENTS OF ATMOSPHERIC PROPERTIES, AND SMALL-SCALE TURBULENCE IN THE ATMOSPHERE.

**----- PIONEER VENUS 1, DONAHUE-----**

**INVESTIGATION NAME-** PARTICIPATING THEORIST DONAHUE

**NSSDC ID-** 78-051A-04

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
AERONOMY  
IONOSPHERES  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - T.M. DONAHUE
-------------------

U OF MICHIGAN

**BRIEF DESCRIPTION**

THIS INVESTIGATION COMBINED RESULTS OBTAINED FROM THE ORBITER MISSION WITH RESULTS FROM THE MULTI-PROBE MISSION TO OBTAIN A UNIFIED PICTURE OF THE ATMOSPHERIC AND IONOSPHERIC CHEMISTRY AND TRANSPORT PROCESSES OCCURRING IN THE ATMOSPHERE OF VENUS.

**----- PIONEER VENUS 1, EVANS-----**

**INVESTIGATION NAME-** TRANSIENT GAMMA-RAY SOURCES

**NSSDC ID-** 78-051A-05

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
GAMMA-RAY ASTRONOMY

**PERSONNEL**

PI - W.D. EVANS	LOS ALAMOS SCI LAB
OI - J.P. CONNER	LOS ALAMOS SCI LAB
OI - P.R. HIGBIE	LOS ALAMOS SCI LAB
OI - R.W. KLEBESADEL	LOS ALAMOS SCI LAB
OI - R.A. OLSON	LOS ALAMOS SCI LAB
OI - I.B. STRONG	LOS ALAMOS SCI LAB
OI - R.E. SPALDING	SANDIA LABORATORIES

**BRIEF DESCRIPTION**

AN OMNIDIRECTIONAL GAMMA-RAY DETECTOR EMPLOYING TWO PHOSWICH SCINTILLATION SPECTROMETERS SENSITIVE TO PROTONS FROM 0.2 TO 2.0 MEV WERE USED WITH LOGIC CIRCUITRY TO DETECT THE BEGINNING OF A GAMMA EVENT AND TO INITIATE A PERIOD OF RAPID DATA COLLECTION. DATA WERE STORED IN A MEMORY UNIT FOR SUBSEQUENT TRANSMISSION TO EARTH. CONFIRMATION THAT A TRUE GAMMA EVENT HAD OCCURRED WAS OBTAINED BY COMPARISON WITH RESULTS FROM OTHER EXPERIMENTS IN EARTH SATELLITES. THIS EXPERIMENT PROVIDED THE LONG BASELINE TIME CORRELATIONS NECESSARY FOR CALCULATING ACCURATE SOURCE LOCATIONS.

**----- PIONEER VENUS 1, HANSEN-----**

**INVESTIGATION NAME-** CLOUD PHOTOPOLARIMETER

**NSSDC ID-** 78-051A-06

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.E. HANSEN	NASA-GISS
OI - P.H. STONE	MASS INST OF TECH
OI - A.A. LACIS	NASA-GISS
OI - D.L. COFFEEN	NASA-GISS
OI - L. TRAVIS	NASA-GISS

**BRIEF DESCRIPTION**

THIS EXPERIMENT USED A SIMPLIFIED VERSION OF THE IMAGING PHOTOPOLARIMETER FLOWN ON PIONEER 10 AND 11 TO PROVIDE LOW-RESOLUTION, FOUR-COLOR MAPS OF THE VENUSIAN CLOUD COVER WITH A HIGH-RESOLUTION IMAGING CAPABILITY NEAR APOCENTER. THE PRINCIPAL OBJECTIVE OF THIS INVESTIGATION WAS TO DETERMINE THE PROPERTIES OF THE CLOUDS AND HAZE, INCLUDING THE VERTICAL AND HORIZONTAL DISTRIBUTION OF THE PARTICLES, CLOUD PARTICLE SIZE AND REFRACTIVE INDEX, THE CLOUD-TOP HEIGHT, AND THE NUMBER DENSITY OF PARTICLES.

**----- PIONEER VENUS 1, KNUDSEN-----**

**INVESTIGATION NAME-** RETARDING POTENTIAL ANALYZER

**NSSDC ID-** 78-051A-07

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
PLANETARY IONOSPHERES

**PERSONNEL**

PI - W.C. KNUDSEN	LOCKHEED PALO ALTO
OI - K. SPANNER	INST FUR PHYS WELTRAUM
OI - R.C. WHITTEN	NASA-ARC

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED A LANGMUIR-PROBE RETARDING-POTENTIAL ANALYZER DESIGNED TO MEASURE ELECTRON CONCENTRATION AND TEMPERATURE, MAJOR ION CONCENTRATIONS AND TEMPERATURES, ION DRIFT VELOCITIES, AND THE ENERGY DISTRIBUTION FUNCTION OF AMBIENT PHOTOELECTRONS. IT WAS AN ADAPTATION OF THE INSTRUMENT FLOWN ON THE GERMAN AEROS SATELLITE IN 1972. EITHER ONE OF TWO SENSOR HEADS COULD HAVE BEEN USED, EACH CONSISTING OF A MULTIGRID CUP AND ELECTROMETER, WHICH COULD OPERATE IN ELECTRON, ION, OR PHOTOELECTRON MODES, INITIATED BY SPACECRAFT ROLL PULSES. THE MEASUREMENTS TAKEN WHEN THE SENSOR AXIS WAS CLOSEST TO THE PLASMA FLOW VELOCITY VECTOR ARE TRANSMITTED. THE AIMS OF THE INVESTIGATION WERE TO IMPROVE KNOWLEDGE OF THE IMPORTANT IONIC REACTIONS IN THE VENUSIAN IONOSPHERE, TO STUDY THE PLASMA TRANSPORT PROCESSES TO DETERMINE IF VENUS HAS A POLAR WIND, TO STUDY THE PROCESSES AT THE SOLAR WIND-IONOSPHERE BOUNDARY, AND TO STUDY SIMILAR AIMS CONCERNING THE AMBIENT ELECTRON POPULATION.

----- PIONEER VENUS 1, MASURSKY -----

INVESTIGATION NAME- PARTICIPATING THEORIST MASURSKY

NSSDC ID- 78-051A-08

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
GEODESY AND CARTOGRAPHY  
PLANETOLOGY

PERSONNEL

PI - H. MASURSKY

US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

SURFACE PROFILE, ROUGHNESS, AND ELECTRICAL PROPERTIES DATA FROM THE PIONEER VENUS RADAR ALTIMETER WERE ANALYZED IN CONJUNCTION WITH SPACECRAFT-DERIVED GRAVITY INFORMATION AND EARTH-BASED RADAR BACKSCATTER DATA TO PRODUCE A SERIES OF CARTOGRAPHIC AND GEOLGIC MAPS. THE INITIAL MAPS INCLUDED GEOMETRIC ARRAYS OF RADAR PROFILE AND TOPOGRAPHIC CONTOUR DATA. THESE WERE THEN UTILIZED TO PRODUCE A SHADED RELIEF CARTOGRAPHIC MAP, SCALE 1 TO 25 MILLION, WITH SUPERIMPOSED CONTOUR INFORMATION. PRELIMINARY VENUSIAN GEOLGIC INFORMATION, INFERRED FROM ALL AVAILABLE SPACECRAFT AND EARTH-BASED RADAR DATA SOURCES, WILL SUBSEQUENTLY BE ADDED TO THE CARTOGRAPHIC MAP BASE TO PRODUCE GEOLGIC MAPS. IT IS ANTICIPATED THAT ONE TO THREE LARGER SCALE (1 TO 5 MILLION) CARTOGRAPHIC AND GEOLGIC MAPS OF SCIENTIFICALLY INTERESTING VENUS SURFACE FEATURES ALSO WILL BE PRODUCED.

----- PIONEER VENUS 1, MCGILL -----

INVESTIGATION NAME- PARTICIPATING THEORIST MCGILL

NSSDC ID- 78-051A-09

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY

PERSONNEL

PI - G.E. MCGILL

U OF MASSACHUSETTS

BRIEF DESCRIPTION

INVESTIGATIONS OF THE TOPOGRAPHY AND GEOLOGY OF VENUS WERE UNDERTAKEN TO ASSURE CORRECT RECOGNITION OF TOPOGRAPHIC AND MATERIAL CHARACTERISTICS OF THE PLANET AND TO ARRIVE AT THE GEOLOGICAL AND GEOPHYSICAL INTERPRETATION OF THESE CHARACTERISTICS.

----- PIONEER VENUS 1, NAGY -----

INVESTIGATION NAME- PARTICIPATING THEORIST NAGY

NSSDC ID- 78-051A-10

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
AERONOMY  
PLANETARY IONOSPHERES  
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.F. NAGY

U OF MICHIGAN

BRIEF DESCRIPTION

INVESTIGATIONS OF THE IONOSPHERE OF VENUS WERE OPTIMIZED BY EXTENDING CURRENT MODELS AND FORMULATING A MISSION PLAN BEST SUITED TO ADDRESS TOPICS INCLUDING THE PHYSICS OF THE SOLAR WIND-IONOSPHERE INTERACTION, ENERGETICS OF THE UPPER ATMOSPHERE, ION CHEMISTRY, AND THE PROCESSES RESPONSIBLE FOR THE GENERAL STRUCTURE OF THE IONOSPHERE, INCLUDING MECHANISMS RESPONSIBLE FOR THE MAINTENANCE OF THE NIGHTTIME IONOSPHERE.

----- PIONEER VENUS 1, NIEMANN -----

INVESTIGATION NAME- NEUTRAL PARTICLE MASS SPECTROMETER

NSSDC ID- 78-051A-11

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
AERONOMY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - H.B. NIEMANN  
OI - G.R. CARIGNAN  
OI - R.E. HARTLE  
OI - N.W. SPENCER

NASA-GSFC  
U OF MICHIGAN  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE EXPERIMENT USED A QUADRUPOLE MASS SPECTROMETER WITH THREE ION SOURCE OPERATING MODES AND THREE MASS SCANNING MODES. THE ION SOURCE COULD BE OPERATED ALTERNATELY IN OPEN AND CLOSED CONFIGURATIONS TO INCREASE ACCURACY. AN ADAPTIVE MASS SCAN WAS USED TO REDUCE THE BIT RATE REQUIRED FOR A GIVEN INFORMATION RETURN RATE. THE RESOLUTION WAS 1.E-4 FOR ADJACENT MASSES, AND THE MASS RANGE WAS 1 TO 45 U. VERTICAL AND HORIZONTAL DENSITY VARIATIONS OF THE MAJOR NEUTRAL CONSTITUENTS OF THE UPPER ATMOSPHERE OF VENUS WERE DETECTED AND MEASURED TO DEFINE THE DYNAMIC, CHEMICAL, AND THERMAL STATES OF THE UPPER ATMOSPHERE. IMPORTANT CONSTITUENTS MEASURED WERE He, O, O<sub>2</sub>, CO, CO<sub>2</sub> AND/OR

H<sub>2</sub>, AND A. IT WAS ALSO POSSIBLE TO STUDY H, D AND/OR H<sub>2</sub>, C<sub>2</sub> AND NO.

----- PIONEER VENUS 1, PETTENGILL -----

INVESTIGATION NAME- RADAR ALTIMETER

NSSDC ID- 78-051A-02

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
GEODESY AND CARTOGRAPHY  
PLANETOLOGY

PERSONNEL

PI - G. PETTENGILL  
OI - W.E. BROWN, JR.  
OI - W.P. KAULA  
OI - D.H. STAELIN

MASS INST OF TECH  
NASA-JPL  
U OF CALIF, LA  
MASS INST OF TECH

BRIEF DESCRIPTION

A RADAR ALTIMETER WAS USED TO OBTAIN INFORMATION ON THE ORBITER ALTITUDE, PLANETARY SURFACE TEMPERATURE, AND RADAR SCATTERING PROPERTIES IN ORDER TO INFER THE SURFACE TOPOGRAPHY, GEOLOGY, AND THE THERMAL AND MECHANICAL PROPERTIES OF THE INTERIOR OF VENUS. THE WEIGHT OF THE INSTRUMENT WAS 9.0 KG (20 LB), AND THE POWER CONSUMPTION WAS 25 W.

----- PIONEER VENUS 1, RUSSELL -----

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 78-051A-12

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - C.T. RUSSELL  
OI - P.J. COLEMAN, JR.  
OI - F.V. CORONITI  
OI - C.F. KENNELL  
OI - R.L. MCPHERRON  
OI - G.L. SISCOE

U OF CALIF, LA  
U OF CALIF, LA

BRIEF DESCRIPTION

THIS EXPERIMENT USED A TRIAXIAL FLUXGATE MAGNETOMETER WITH TWO RING CORE SENSORS AT THE END OF A MAGNETOMETER BOOM AND ONE RING CORE SENSOR, AT 45 DEG TO THE SPIN AXIS, HALFWAY DOWN THE BOOM. THE DRIVE AND ELECTRONICS DESIGN HAD BEEN USED ON THE APOLLO 15 AND 16 SURROUNDSATellites. THE OBJECTIVES WERE TO DETERMINE ANY PLANETARY AND REMANENT MAGNETIC FIELDS, TO DEDUCE THE LOCATION AND STRENGTH OF IONOSPHERIC CURRENT SYSTEMS, TO DETERMINE THE ENERGY AND MASS BALANCE IN THE UPPER ATMOSPHERE OF VENUS, TO DETERMINE THE NATURE OF THE SOLAR WIND INTERACTION WITH VENUS, AND TO STUDY THE NEAR-WAKE REGION OF VENUS AND THE STRUCTURE OF THE VENUSIAN BOW SHOCK. INTERPLANETARY OBJECTIVES WERE TO DETERMINE THE PERTURBATION OF THE NEAR-PLANET REGION BY VENUS AND TO COMPARE THE PROPERTIES OF THE AVERAGE FIELD AT 0.7 AND 1.0 AU. THE INSTRUMENT WAS INTENDED TO, IN THE WORST CASE OF LOW-BIT AND LOW-SAMPLE RATES, MEASURE ONE VECTOR PER 32 S. WHILE IN VENUS ORBIT, WHEN THE SPACECRAFT WAS COASTING THROUGH THE INTERPLANETARY REGION IN THE APOAPSIS MODE, THE SAMPLE RATE WAS ONE VECTOR PER 8 SEC. WHILE THE SPACECRAFT WAS PASSING THROUGH THE VENUSIAN IONOSPHERE IN THE PERIAPSIS MODE, THE SAMPLE RATE WAS FOUR VECTORS PER S.

----- PIONEER VENUS 1, SCARF -----

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR

NSSDC ID- 78-051A-13

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - F.L. SCARF  
OI - I.M. GREEN

TRW SYSTEMS GROUP  
TRW SYSTEMS GROUP

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A MODIFIED VERSION OF THE PIONEER 8 AND PIONEER 9 EXPERIMENTS TO MEASURE THE ELECTRIC FIELD COMPONENTS IN FOUR 30 PERCENT NARROW-BAND CHANNELS CENTERED AT 100, 750, 7550, AND 30,000 Hz. THEAIMS OF THE INVESTIGATION WERE TO PERFORM THE FIRST ANALYSIS OF VLF ELECTRIC FIELDS AT VENUS TO ELUCIDATE THE PLASMA INTERACTIONS BETWEEN THE SOLAR WIND AND THE JONOSPHERIC OR EXOSPHERIC PLASMA, THE ROLE OF PLASMA INSTABILITIES IN MODIFYING THE HEATFLUX FROM THE SOLAR WIND AND IN THERMALIZING NEWLY BORN IONS FROM VENUS WERE ALSO STUDIED. A SELF-CONTAINED BALANCED V-TYPE ANTENNA WITH A DIFFERENTIAL FREQUENCY AMPLIFIER WAS EMPLOYED TO MAKE THE MEASUREMENTS. AT THE 512-BPS SATELLITE MODE, ONE FREQUENCY SCAN PER S WAS OBTAINED.

----- PIONEER VENUS 1, SCHUBERT -----

INVESTIGATION NAME- PARTICIPATING THEORIST SCHUBERT

NSSDC ID- 78-051A-14

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
MAGNETOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
PLANETOLOGY  
GEODESY AND CARTOGRAPHY

PERSONNEL  
PI - G. SCHUBERT

U OF CALIF- LA

BRIEF DESCRIPTION

MEASUREMENTS OF PLASMA TEMPERATURES, MAGNETIC FIELDS, COMPOSITION, AND OTHER DATA WERE USED TO DEVELOP AND TEST THEORIES OF ATMOSPHERIC CIRCULATION AND SOLAR WIND-IONOSPHERE INTERACTIONS. IN THE CASE OF THE TOPOGRAPHY AND GRAVITY, THE DATA (ALTIMETRY AND TRACKING) WERE USED BOTH IN DESCRIPTIVE FASHION, TO SIMPLY CHARACTERIZE THE SURFACE OF VENUS AND ITS GRAVITATIONAL FIELD, AND IN A MORE QUANTITATIVE WAY TO MODEL THE INTERNAL STRUCTURE OF THE PLANET.

----- PIONEER VENUS 1, STEWART -----

INVESTIGATION NAME- PROGRAMMABLE ULTRAVIOLET SPECTROMETER

NSSDC ID- 78-051A-15

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
AERONOMY  
IONOSPHERES

PERSONNEL  
PI - A.J. STEWART  
OI - C.A. BARTH  
OI - C.W. HORD  
OI - G.E. THOMAS  
OI - D. ANDERSON

U OF COLORADO  
U OF COLORADO  
U OF COLORADO  
U OF COLORADO  
NOAA-SEL

BRIEF DESCRIPTION

THIS INVESTIGATION USED A 125-MM CASSEGRAIN TELESCOPE ON A 125-MM EBERT-FASTIE SPECTROMETER WITH A PROGRAMMABLE GRATING DRIVE. AIRGLOW, SCATTERED SUNLIGHT, AND HYDROGEN LYMAN ALPHA EMISSIONS WERE TO BE DETECTED IN THE THERMOSPHERE, MESOSPHERE, AND EXOSPHERE OF VENUS. THESE MEASUREMENTS WERE USED TO ESTABLISH AND MAP THE COMPOSITION, TEMPERATURE, AND PHOTOCHIMISTRY OF THE THERMOSPHERE AND IONOSPHERE, TO DETERMINE THE PRESSURE AT AND ABOVE THE VISIBLE CLOUD TOPS, AND TO ESTABLISH THE DISTRIBUTION AND ESCAPE RATE OF ATOMIC HYDROGEN. THE INSTRUMENT OPERATED IN THE 1100-3400 Å REGION.

----- PIONEER VENUS 1, TAYLOR, JR. -----

INVESTIGATION NAME- ION MASS SPECTROMETER

NSSDC ID- 78-051A-17

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY IONOSPHERES  
PLANETARY ATMOSPHERES

PERSONNEL  
PI - H.A. TAYLOR, JR.  
OI - S.J. BAUER  
OI - R.E. HARTLE  
OI - H.C. BRINTON  
OI - J.R. HERMAN  
OI - T.M. DONAHUE  
OI - P.A. CLOUTIER  
OI - F.C. MICHEL

NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
U OF MICHIGAN  
RICE U  
RICE U

BRIEF DESCRIPTION

THE COMPOSITION AND CONCENTRATION OF THERMAL POSITIVE IONS IN THE IONOSPHERE OF VENUS WERE DETERMINED AND INTERPRETED IN TERMS OF VERTICAL AND HORIZONTAL COMPONENTS. THE INSTRUMENT USED WAS A BENNETT RADIO-FREQUENCY MASS SPECTROMETER BASED ON THE DESIGN OF THOSE FLOWN ON OGO AND ATMOSPHERIC EXPLORER SATELLITES. A MASS RANGE OF 1 TO 60 U WAS COVERED WITH A VARIETY OF AUTOMATIC SCAN-SEARCH MODES AVAILABLE.

----- PIONEER VENUS 1, WOLFE -----

INVESTIGATION NAME- SOLAR WIND PLASMA DETECTOR

NSSDC ID- 78-051A-18

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - J.H. WOLFE  
OI - A. BARNES  
OI - H.R. COLLARD  
OI - D.D. MCIBBIN  
OI - J.D. MINALOV  
OI - R.C. WHITTEN  
OI - D.S. INTRILIGATOR

NASA-ARC  
NASA-ARC  
NASA-ARC  
NASA-ARC  
NASA-ARC  
NASA-ARC  
U OF SOUTHERN CALIF

BRIEF DESCRIPTION

THE INSTRUMENT FOR THIS EXPERIMENT WAS A QUADRISpherical ELECTROSTATIC ANALYZER (DETECTOR B OF THE PIONEER'S 10-11 PLASMA INSTRUMENT). WITH FIVE CURRENT COLLECTORS AND ELECTROMETERS. THE ENERGY/CHARGE RANGE WAS 50-8000 (IONS) IN 32 STEPS AND 1-500 (ELECTRONS) IN 16 STEPS. THE ANGULAR RANGE COVERED WAS PLUS OR MINUS 85 DEG ELEVATION BY 360 DEG AZIMUTH, AND THE DETECTOR FIELD OF VIEW WAS 15 DEG TIMES 25 DEG OR 15 DEG TIMES 45 DEG, DEPENDING ON POSITION. THE LOGIC DESIGN WAS ESSENTIALLY THAT USED ON PIONEER 8 AND 9. THE OBJECTIVES WERE TO MEASURE SOLAR WIND CONDITIONS OUTSIDE THE VENUSIAN BOW SHOCK, INSIDE THE MAGNETOSHEATH FLOW FIELD, AND TO STUDY THE IONOPAUSE STRUCTURE. SOLAR WIND MEASUREMENTS WERE MADE DURING THE TRANSIT TO VENUS, PARTICULARLY TO STUDY MACROSCALE PROBLEMS AND TO DETERMINE AVERAGE GRADIENTS. THE NEAR-PLANET WAKE REGION WAS ALSO AVAILABLE FOR STUDY.

\*\*\*\*\* PROGN02 78-051A-18 \*\*\*\*\*

SPACECRAFT CALLSIGN NAME- PROGN02 ?  
ALTERNATE NAMES- 11028

NSSDC ID- 78-101A

LAUNCH DATE- 10/30/78 WEIGHT- 915. KG  
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.  
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY  
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/31/78  
ORBIT PERIOD- 5889. MIN INCLINATION- 65. DEG  
PERIASTRON- 483. KM ALT APPOAPSIS- 202965. KM ALT

PERSONNEL  
PI - A.A. GALEEV IKI

BRIEF DESCRIPTION  
THIS SPACECRAFT WAS A MEMBER OF A CONTINUING SERIES TO MEASURE CHARGED PARTICLES, PLASMA, MAGNETIC FIELDS AND ELECTROMAGNETIC RADIATION. THIS MISSION WAS PART OF THE SOCIALIST COUNTRIES' CONTRIBUTION TO THE INTERNATIONAL MAGNETOSPHERIC STUDY. THE SPECIFIC SCIENTIFIC GOALS OF THIS MISSION WERE: (1) TO STUDY SOLAR UV, X-RAY, AND GAMMA-RAY EMISSIONS, (2) TO MONITOR ELECTRONS AND PROTONS IN INTERPLANETARY SPACE AND THE MAGNETOSPHERE, (3) TO INVESTIGATE THE NUCLEAR COMPOSITION OF SOLAR AND GALACTIC COSMIC RAYS, (4) TO MEASURE MAGNETIC FIELDS, (6) TO SEARCH FOR DISCRETE GAMMA-RAY LINES FROM THE SUN AND SPACE, (7) TO ANALYZE UV RADIATION FOR POSSIBLE EXCESS IN THE GALACTIC PLANE, AND (8) TO ANALYZE HEAVY HIGH-ENERGY IONS IN THE MAGNETOSPHERE.

----- PRGNC02 78-101A-04 -----

INVESTIGATION NAME- THREE-AXIS FLUXGATE MAGNETOMETERS  
INVESTIGATIVE PROGRAM  
SCIENCE

NSSDC ID- 78-101A-04  
INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL  
PI - SH.SH.DOLGINOV IZMIRAN

BRIEF DESCRIPTION  
TWO THREE-AXIS FLUXGATE MAGNETOMETERS WERE USED TO MEASURE VECTOR MAGNETIC FIELDS FROM 1 TO 1-200 NT (GAMMAS) WITH AN INTENSITY RESOLUTION OF 0.5 NT. BOTH INTERPLANETARY AND GEOMAGNETIC TAIL FIELDS WERE CAPABLE OF BEING MEASURED.

----- PROGN02 78-101A-03 -----

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER

NSSDC ID- 78-101A-03  
INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY  
SOLAR PHYSICS

PERSONNEL  
PI - I.V. ESTULIN  
PI - G. VEDRENNE

IKI  
CESR

ORIGINAL PAGE IS  
OF POOR QUALITY



**BRIEF DESCRIPTION**

THE ENERGY AND MASS COMPOSITION OF CHARGED PARTICLES WERE MEASURED IN THE RANGE 100 TO 800 MEV/NUCLEON. THE DETAILS OF THE INSTRUMENT HAVE BEEN REQUESTED FROM GALEEV (3/79) BUT NOT YET RECEIVED.

----- PROGNOZ 7, LOGACHEV -----

INVESTIGATION NAME- GAS DISCHARGE COUNTER

NSSDC ID- 78-101A-13 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS

**PERSONNEL**

PI - Yu.I. LOGACHEV

INST NUCLEAR PHYSICS

**BRIEF DESCRIPTION**

MEASUREMENTS OF ENERGETIC PARTICLES FROM 10 TO 800 MEV/NUCLEON WERE OBTAINED. DETAILS OF THE INSTRUMENTATION HAVE BEEN REQUESTED FROM GALEEV (3/79) BUT NOT YET RECEIVED.

----- PROGNOZ 7, PISARENKO -----

INVESTIGATION NAME- ENERGETIC ELECTRON SPECTROMETER

NSSDC ID- 78-101A-09 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
INTERPLANETARY PHYSICS

**PERSONNEL**

PI - N.F. PISARENKO  
PI - L. TREGER

IKI  
CENS

**BRIEF DESCRIPTION**

THE INSTRUMENT MEASURED ELECTRONS BETWEEN 3 AND 120 MEV. THE DETAILS OF THE INSTRUMENT HAVE BEEN REQUESTED FROM GALEEV (3/79) BUT NOT YET RECEIVED.

----- PROGNOZ 7, SEVERNYY -----

INVESTIGATION NAME- UV EMISSION SPECTROMETER

NSSDC ID- 78-101A-10 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
AERONOMY  
SOLAR PHYSICS

**PERSONNEL**

PI - A.B. SEVERNYY  
PI - G.C. COURTES

CRIMEAN ASTROPHYS OBS  
CNRS-LAS

**BRIEF DESCRIPTION**

AN ULTRAVIOLET EMISSION SPECTROMETER TO MEASURE BOTH ATMOSPHERIC AND INTERPLANETARY SPECTRA WAS USED. THE DETAILS OF THE INSTRUMENT HAVE BEEN REQUESTED FROM GALEEV (3/79) BUT NOT YET RECEIVED. IF THIS IS SIMILAR TO THE EXPERIMENT ON PROGNOZ 6, IT IS A SCANNING SPECTROMETER BETWEEN 1100 AND 1900 Å WITH A 6 BY 6 DEG FIELD OF VIEW. THE BANDWIDTH OF THE SPECTROMETER IS 200 Å AND THE SPECTRAL REGION IS SCANNED IN 55 STEPS.

----- PROGNOZ 7, VAISBERG -----

INVESTIGATION NAME- SELECTIVE COMBINED PLASMA SPECTROMETER (SCS)

NSSDC ID- 78-101A-01 INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - O.L. VAISBERG

IKI

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTED OF: (1) THREE CYLINDRICAL ELECTROSTATIC ANALYZERS FOR MEASURING THE ION SPECTRUM FROM 0.25 TO 5 KEV/CHARGE; (2) TWO COMBINED ANALYZERS WITH WIEN FILTERS AND ELECTROSTATIC ANALYZERS FOR SELECTIVE MEASUREMENTS OF PROTONS IN THE SAME ENERGY RANGE; (3) TWO CYLINDRICAL ELECTROSTATIC ANALYZERS FOR MEASURING ELECTRONS FROM 10 TO 200 EV; AND (4) THREE INTEGRAL ION FLUX DETECTORS LOOKING IN DIFFERENT DIRECTIONS SO THAT THE TOTAL SOLAR WIND FLUX AND DIRECTION COULD BE DETERMINED. PLASMA MEASUREMENTS IN THE INTERPLANETARY MEDIUM AND THE MAGNETOSPHERE WERE CARRIED OUT.

\*\*\*\*\* SAGE \*\*\*\*\* SAGE\*\*\*\*\* SAGE\*\*\*\*\* SAGE\*\*\*\*\* SAGE\*\*\*\*\*

SPACECRAFT COMMON NAME- SAGE

ALTERNATE NAMES- AER-B, STRAT AERO AND GAS EXP  
APPL EXPL MISSION B, 11270

NSSDC ID- 79-013A

LAUNCH DATE- 02/18/79 WEIGHT- 148.7 KG  
LAUNCH SITE- WALLOPS FLIGHT CENTER, UNITED STATES  
LAUNCH VEHICLE- SCOUT-F

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSTA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 96.8 MIN  
PERIAPSIS- 547.5 KM ALT

EPOCH DATE- 02/19/79  
INCLINATION- 54.9 DEG  
APOAPSIS- 660.2 KM ALT

PERSONNEL  
MG - D.S. BILLER  
SC - R.A. SCHIFFER  
PM - C.M. MACKENZIE  
PS - R.S. FRASER

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

**BRIEF DESCRIPTION**

THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE) SPACECRAFT SERVED AS A SMALL, VERATILE, LOW-COST PLATFORM CARRYING A SINGLE EXPERIMENT DESIGNED TO DETERMINE THE SPATIAL DISTRIBUTION OF STRATOSPHERIC AEROSOLS AND OZONE ON A GLOBAL SCALE. THE SAGE OBTAINED AEROSOL AND OZONE INFORMATION BY MEASURING THE ATTENUATION OF SOLAR RADIATION BY THE EARTH'S ATMOSPHERE AT FOUR SEPARATE WAVELENGTHS.

----- SAGE, MCCORMICK -----

INVESTIGATION NAME- STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE)

NSSDC ID- 79-013A-01

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
UPPER ATMOSPHERE RESEARCH  
METEOROLOGY

PERSONNEL  
PI - R.P. MCCORMICK  
OI - D.M. CUNNOLD  
OI - G.W. GRAPS  
OI - B.M. HERMAN  
OI - D.E. PILLER  
OI - D.G. MURRAY  
OI - T.J. PEPPIN  
OI - W.G. PLANET  
OI - P.B. RUSSELL

NASA-LARC  
GEORGIA INST OF TECH  
GEORGIA INST OF TECH  
U OF ARIZONA  
METEOROLOGICAL OFFICE  
U OF DENVER  
U OF WYOMING  
NOAA-NESSE  
SRI INTERNATIONAL

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE) WERE TO DETERMINE THE SPATIAL DISTRIBUTION OF STRATOSPHERIC AEROSOLS AND OZONE ON A GLOBAL SCALE. SPECIFIC OBJECTIVES WERE: (1) TO DEVELOP A SATELLITE-BASED REMOTE SENSING TECHNIQUE FOR STRATOSPHERIC AEROSOLS AND OZONE; (2) TO MAP AEROSOL AND OZONE CONCENTRATIONS ON A TIME SCALE SHORTER THAN MAJOR STRATOSPHERIC CHANGES; (3) TO LOCATE STRATOSPHERIC AEROSOL AND OZONE SOURCES AND SINKS; (4) TO MONITOR CIRCULATION AND TRANSFER PHENOMENA; (5) TO OBSERVE HEMISPHERE DIFFERENCES; AND (6) TO INVESTIGATE THE OPTICAL PROPERTIES OF AEROSOLS AND ASSESS THEIR EFFECTS ON GLOBAL CLIMATE. THE SAGE INSTRUMENT CONSISTED OF A GREGORIAN TELESCOPE AND A DETECTOR SUBASSSEMBLY WHICH MEASURED THE ATTENUATION OF SOLAR RADIATION AT FOUR WAVELENGTHS (.38, .45, .6, AND 1.0 MICRORAMETERS) DURING SOLAR OCCULTATION. AS THE SPACECRAFT EMERGED FROM THE EARTH'S SHADOW, THE SENSOR SCANNED THE EARTH'S ATMOSPHERE FROM THE HORIZON UP, AND MEASURED THE ATTENUATION OF SOLAR RADIATION BY DIFFERENT ATMOSPHERIC LAYERS. THIS PROCEDURE WAS REPEATED DURING SPACECRAFT SUNSET. TWO VERTICAL SCANNINGS WERE OBTAINED DURING EACH ORBIT, WITH EACH SCAN REQUIRING APPROXIMATELY 1 MIN OF TIME TO COVER THE ATMOSPHERE ABOVE THE TROPOSPHERE. THE INSTRUMENT HAD A FIELD OF VIEW OF APPROXIMATELY 0.5 MIN OF ARC WHICH RESULTED IN A VERTICAL RESOLUTION OF LESS THAN 1 KM.

\*\*\*\*\* SMM \*\*\*\*\* SMM\*\*\*\*\* SMM\*\*\*\*\* SMM\*\*\*\*\* SMM\*\*\*\*\*

SPACECRAFT COMMON NAME- SMM  
ALTERNATE NAMES- SOLAR MAXIMUM MISSION, 11703

NSSDC ID- 80-014A

LAUNCH DATE- 02/14/80 WEIGHT- 2315. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 96.12 MIN  
PERIAPSIS- 571.9 KM ALT

EPOCH DATE- 02/15/80  
INCLINATION- 28.5 DEG  
APOAPSIS- 573.9 KM ALT

PERSONNEL

PI - M.E. McDONALD  
OI - J.D. BOHLIN  
PH - P.L. BURR  
PS - K.O. FROST

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE SOLAR MAXIMUM MISSION (SMM) IS DEDICATED TO COORDINATED OBSERVATIONS OF SPECIFIC SOLAR ACTIVITY AND SOLAR FLARE PROBLEMS. THE SPACECRAFT IS ORIENTED TOWARD THE SUN DURING THE DAYLIGHT PORTION OF THE ORBIT. THE SPACECRAFT ITSELF DOES NOT RASTER OVER THE SOLAR DISK, ALTHOUGH INDIVIDUAL INSTRUMENTS HAVE THIS CAPABILITY. THE SMM SPACECRAFT IS DESIGNED SO THAT IT CAN BE RETRIEVED BY AN EARLY SHUTTLE FLIGHT, RETURNED TO EARTH, REFURBISHED AND FITTED WITH AN UPDATE PAYLOAD, AND RETURNED TO ORBIT FOR ANOTHER SOLAR-ORIENTED MISSION.

----- SMM, ACTON -----

INVESTIGATION NAME- SOFT X-RAY POLYCHROMATOR (XRP)

NSSDC ID- 80-014A-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - L.W. ACTON  
PI - A.M. GABRIEL  
PI - J.A. CULHANE  
OI - R.C. CATURA  
OI - J.H. PARKINSON  
OI - C.B. RAPLEY  
OI - B.B. JONES  
OI - C. JORDAN  
OI - C.J. WOLFSON  
OI - D.C. FAWCETT

LOCKHEED PALO ALTO  
APPLETON LAB  
U COLLEGE LONDON  
LOCKHEED PALO ALTO  
U COLLEGE LONDON  
U COLLEGE LONDON  
APPLETON LAB  
OXFORD U  
LOCKHEED PALO ALTO  
APPLETON LAB

BRIEF DESCRIPTION

THIS EXPERIMENT USES X-RAY EMISSION LINES IN THE 0.14-NM TO 2.25-NM SPECTRAL REGION AS DIAGNOSTIC TOOLS TO INVESTIGATE ASPECTS OF SOLAR ACTIVITY LEADING TO PLASMA TEMPERATURES IN THE 1.5 TO 50 MILLION DEG K RANGE. THE INSTRUMENTATION INCLUDES TWO SYSTEMS, A FLAT-CRYSTAL SPECTROMETER AND A BENT-CRYSTAL SPECTROMETER. THE FLAT-CRYSTAL SPECTROMETER COVERS FROM 0.14 TO 2.25 NM IN 7 RANGES, HAS A FIELD OF VIEW OF 10 BY 10 ARC S, AND CAN RASTER OVER A 7 BY 7 ARC MIN AREA. ITS BEST TIME RESOLUTION IS 0.25 S. THE BENT-CRYSTAL SPECTROMETER CONSISTS OF A SET OF BENT CRYSTALS COVERING SEVEN IRON LINES (BETWEEN .1769 AND .1945 NM) AND THE CALCIUM KIX LINE BETWEEN .3165 AND .3231 NM. THIS INSTRUMENT HAS A FIELD OF VIEW OF 6 BY 6 ARC MIN, IS NOT RASTERED AND HAS A MAXIMUM TIME RESOLUTION OF U-1 S.

----- SMM, CHUPP -----

INVESTIGATION NAME- GAMMA RAY SPECTROMETER (GRS)

NSSDC ID- 80-014A-07

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - E.L. CHUPP  
OI - D.J. FORREST  
OI - K. PINKAU  
OI - C. REPPIN  
OI - E. RIEGER  
OI - W.N. JOHNSON  
OI - R.L. KINZER  
OI - J.D. KURFESS  
OI - G.H. SHARE  
OI - A.S. JACOBSON

U OF NEW HAMPSHIRE  
U OF NEW HAMPSHIRE  
MPI-EXTRATEV PHYS  
MPI-EXTRATEV PHYS  
MPI-EXTRATEV PHYS  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
NASA-JPL

BRIEF DESCRIPTION

THE PRIMARY SCIENTIFIC GOAL OF THIS EXPERIMENT IS THE STUDY OF THE VERY HARD X-RAY CONTINUUM FROM THE SUN BEFORE AND DURING SOLAR FLARES. THE MAIN DETECTOR IS A SET OF SEVEN 7.6 BY 7.6-CM SODIUM IODIDE (NaI) INTEGRAL LINE DETECTORS COVERING THE ENERGY RANGE FROM 0.3 TO 9 MEV WITH AN ENERGY RESOLUTION OF BETTER THAN 7 PERCENT (FWHM) AT 0.662 MEV, AND TEMPORAL RESOLUTIONS RANGING FROM 16 S (FULL ENERGY RANGE) TO 1 S (SELECTED ENERGY INTERVAL) TO 0.064 S. SECONDLY, GAMMA RAYS AND NEUTRONS WITH ENERGIES GREATER THAN 10 MEV WILL BE DETECTED. THE DIFFERENT SIGNATURES OF THE LATTER IN THE DETECTOR COMBINED WITH THE NEUTRON TIME OF FLIGHT OVER 1 AU WILL ALLOW DIFFERENTIATION BETWEEN GAMMA RAYS AND NEUTRONS.

----- SMM, DE JAGER -----

INVESTIGATION NAME- HARD X-RAY IMAGING SPECTROMETER (HXRIS)

NSSDC ID- 80-014A-05

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - C. DE JAGER  
OI - H.P. VAN BEEK  
OI - A.P. WILLMORE

U OF UTRECHT  
SPACE RESEARCH LAB  
U OF BIRMINGHAM

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO MEASURE THE POSITION, STRUCTURE, AND THERMODYNAMIC PROPERTIES OF HOT THERMAL AND NONTHERMAL SOURCES IN ACTIVE REGIONS AND FLARES. THIS INSTRUMENT PRODUCES TWO-DIMENSION IMAGES WITH 8 ARC S RESOLUTION OVER A CIRCULAR AREA 2 MIN 40 S IN DIAMETER, OR 32 ARC S RESOLUTION OVER A 6 MIN 24 S BY 6 MIN 24 S AREA. THESE IMAGES ARE OBSERVED IN SIX ENERGY CHANNELS BETWEEN 3.5 AND 30 KEV, AND WITH A TEMPORAL RESOLUTION OF 0.5-7 S, DEPENDING ON THE MODE OF OPERATION. BY MEANS OF A FLARE FLAG, IT ALERTS ALL THE OTHER SMM INSTRUMENTS WHEN A FLARE BEGINS.

----- SMM, FROST -----

INVESTIGATION NAME- HARD X-RAY BURST SPECTROMETER (HRBS)

NSSDC ID- 80-014A-06

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - K.J. FROST  
OI - L.L. ORWIG  
OI - B.R. DENNIS  
OI - T.L. CLINE  
OI - U.D. DESAI

NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURES IMPULSIVE FLARE X-RAY EMISSION WITH 15-CHANNEL ENERGY ANALYSIS AND 0.1-S TIME RESOLUTION IN THE ENERGY RANGE OF 20 TO 260 KEV. A SEARCH FOR FINE TEMPORAL STRUCTURE IN THE IMPULSIVE X-RAY EMISSION WITH A PROGRAMMABLE TIME RESOLUTION OF UP TO 1 MS IS CONDUCTED USING ONE CHANNEL BETWEEN 20 AND 260 KEV. THE HARD X-RAY BURST SPECTROMETER (HRBS) IS A COLLIMATED X-RAY SPECTROMETER SIMILAR TO THE TYPES PREVIOUSLY FLOWN ON OAO-2, OSO 2, AND OSO 5. THE DETECTOR IS VERY SIMILAR TO THAT OF OSO 5, DIFFERING ONLY IN THE CENTRAL DETECTOR AND CHARGED-PARTICLE DETECTOR DESIGNS AND THE ADDITION OF CALIBRATION LIGHT PULSERS TO THE SHIELD COLLIMATOR.

----- SMM, FCUSE -----

INVESTIGATION NAME- CORONAGRAPH/POLARIMETER

NSSDC ID- 80-014A-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - L.L. HOUSE  
OI - W.J. WAGNER  
OI - E.G. HILDNER  
OI - G.A. DULK  
OI - C.B. SAWYER  
OI - R. KOPP  
OI - G.W. PNEUMAN  
OI - C.W. BUELFELD  
OI - H.U. SCHMIDT  
OI - K.V. SHERIDAN

HIGH ALTITUDE OBS  
HIGH ALTITUDE OBS  
HIGH ALTITUDE OBS  
U OF COLORADO  
HIGH ALTITUDE OBS  
LOS ALAMOS SCI LAB  
HIGH ALTITUDE OBS  
HIGH ALTITUDE OBS  
MPI-PHYS ASTROPHYS  
CSIRO, DIV OF RADIOPHYS

BRIEF DESCRIPTION

THE PRIME OBJECTIVE OF THIS EXPERIMENT IS TO MEASURE THE RESPONSE OF THE ELECTRON DENSITY AND MAGNETIC FIELD STRUCTURE OF THE CORONA TO THE PASSAGE OF TRANSIENT PHENOMENA ON RAPID TIME SCALES. THE SECONDARY OBJECTIVE IS TO DETERMINE THE DENSITY AND ORIENTATION OF THE MAGNETIC FIELD STRUCTURE OF THE CORONA ON A SYNOPSIS BASIS. THE CORONAGRAPH/POLARIMETER IS EXTERNALLY OCCULTED BY THREE DISKS, WITH A 2.6-CM DIAMETER PRIMARY OBJECTIVE LENS, OR AIR-SPACED DOUBLET DESIGN. CORONAL QUADRANTS ARE IMAGED AT F/3.6 ON A PEARLLESS VIDICON WITH A NUTATING MIRROR ARRANGEMENT AND ARE RECORDED ON A DEDICATED TAPE RECORDER FOR SUBSEQUENT TRANSMISSION TO THE EARTH. FIELDS OF VIEW RANGE FROM 1.5 TO 6.50 SOLAR RADII AND ARE SELECTABLE WITHIN THE CORONAL QUADRANT. SPATIAL RESOLUTION IS SELECTABLE BETWEEN 6.4 AND 12.0 ARC S. SEVEN FILTERS ARE AVAILABLE WITHIN THE RANGE OF 440 A TO 658.3 NM, AND POLARIZATION IS MEASURED BY A SEQUENCE OF THREE POLAROIDS ORIENTED 60 DEG APART (A CLEAR POSITION IS ALSO AVAILABLE). THE STRAY RADIANCE IS ABOUT 3.E-10 OF THE SOLAR BRIGHTNESS IN THE OUTER FIELD. THE INSTRUMENT IS ON AN INDEPENDENT GIMBAL MOUNT AND IS SUN-CENTERED TO WITHIN 10 ARC S.

----- SMS, TANDBERG-HANSEN -----

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER AND POLARIMETER

NSSDC ID- 80-014A-02 INVESTIGATIVE PROGRAM

CODE ST

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
ATMOSPHERIC PHYSICS  
AERONAUTICS

PERSONNEL

PI - E. TANDBERG-HANSEN	NASA-GSFC
01 - R.G. ATHAY	HIGH ALTITUDE OBS
01 - J.M. BECKERS	SACRAMENTO PEAK OBS
01 - J.C. BRANDT	NASA-GSFC
01 - E.C. BRUNNER, JR.	LOCKHEED PALO ALTO
01 - R.B. CHAPMAN	NASA-GSFC
01 - D.E. WOODBURY	NASA-GSFC

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS EXPERIMENT ARE TO STUDY SOLAR ULTRAVIOLET RADIATIONS FROM ACTIVE REGIONS, FLARES, AND THE CORONA IN ORDER TO DETERMINE THE PHYSICAL PARAMETERS OF TEMPERATURE, DENSITY, VELOCITY, AND MAGNETIC FIELD IN THE SUN'S ATMOSPHERE, AND TO CONDUCT AN AERONAUTICS PROGRAM TO MEASURE VARIOUS CONSTITUENTS IN THE EARTH'S ATMOSPHERE BY MEASURING THE ATMOSPHERIC EXTINCTION OF SUNLIGHT AT SPACECRAFT DUSK AND DAWN. THIS INSTRUMENT IS A MODIFIED VERSION OF THE TELESCOPE-SPECTROGRAPH SYSTEM FLOWN ON THE EIGHTH ORBITING SOLAR OBSERVATORY (CO8-8). THE INSTRUMENT COVERS THE 110- TO 300 NM REGION WITH A SPECTRAL RESOLUTION OF ABOUT 0.010 NM FWHM, AND OBSERVES AN AREA OF TO 4 BY 4 ARC MIN IN SIZE AT A POINT DETERMINED BY THE SPACECRAFT POINTING SYSTEM, WITH A SPATIAL RESOLUTION COMMANDABLE BETWEEN 1 BY 1 ARC S AND 30 BY 30 ARC S. POLARIZATION IS MEASURED USING A ROTATING QUARTER-WAVE PLATE INSERTED IN THE LIGHT PATH SO ALL FOUR STOKES PARAMETERS CAN BE DETERMINED. IT IS POSSIBLE TO SELECT ANY OF SIX PAIRS OF LINES FOR POLARIMETRY AND ANY OF THREE SETS OF FOUR LINES FOR SPECTROSCOPY TO ALLOW SIMULTANEOUS ANALYSIS AT DIFFERENT HEIGHTS IN THE SOLAR ATMOSPHERE.

----- SMS, WILLSON -----

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR

NSSDC ID- 80-014A-02 INVESTIGATIVE PROGRAM

CODE ST

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - R.C. WILLSON	NASA-JPL
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BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS THE MEASUREMENT OF THE TOTAL SOLAR IRRADIANCE WITH STATE-OF-THE-ART ACCURACY AND PRECISION. THE TOTAL SOLAR IRRADIANCE FROM THE FAR-ULTRAVIOLET THROUGH THE FAR-INFRARED WAVELENGTHS IS MEASURED BY THREE ACTIVE-CAVITY RADIOMETER (TYPE IV) DETECTORS. THESE DETECTORS ARE ELECTRICALLY SELF-CALIBRATED, CAVITY PYRHELIOMETERS AND ARE EACH CAPABLE OF DEFINING THE ABSOLUTE RADIATION SCALE WITH AN UNCERTAINTY OF 0.2 PERCENT IN THE INTERNATIONAL SYSTEM OF UNITS.

\*\*\*\*\* SMS 1 \*\*\*\*\*

SPACECRAFT COMMON NAME- SMS 1  
ALTERNATE NAMES- SMS-A, SYNCH METEOROL SATELL A  
AEROS, MED1

NSSDC ID- 74-033A

LAUNCH DATE- 05/17/74 WEIGHT- 227. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NES
UNITED STATES	NASA-GSFC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 05/23/74
ORBIT PERIOD- 1340.4 MIN	INCLINATION- 1.0 DEG
PERIAPSIS- 32345.0 KM ALT	APOAPSIS- 35039.0 KM ALT

PERSONNEL

PI - T.J. KARRAS	NOAA-NES
PS - W.E. SHENK	NASA-GSFC

BRIEF DESCRIPTION

THE SMS 1 WAS A NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT, THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIED (1) A VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR) WHICH PROVIDED HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA AND MADE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM; (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM WHICH RELAYED PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL APT-EQUIPPED REGIONAL STATIONS AND COLLECTED AND RETRANSMITTED DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS; AND (3) A

SPACE ENVIRONMENTAL MONITOR (SEM) WHICH MEASURED PROTON, ELECTRON, AND SOLAR X-RAY FLUXES AND MAGNETIC FIELDS. THE CYLINDRICALLY SHAPED SPACECRAFT MEASURED 190.0 CM IN DIAMETER AND 250 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDED AN ADDITIONAL 83 CM BEYOND THE CYLINDER SHELL. THE PRIMARY STRUCTURAL MEMBERS WERE A HONEYCOMBED EQUIPMENT SHELF AND A THRUST TUBE. THE VISSR TELESCOPE WAS MOUNTED ON THE EQUIPMENT SHELF AND VIEWED THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDED RADIALLY OUT FROM THE THRUST TUBE AND WAS AFFIXED TO THE SOLAR PANELS, WHICH FORMED THE CUTTER WALLS OF THE SPACECRAFT, AND PROVIDED THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS WERE STATION KEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) WERE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USED BOTH UHF AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAD ATTAINED SYNCHRONOUS ORBIT.

----- SMS 1, NSS STAFF -----

INVESTIGATION NAME- VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 74-033A-01 INVESTIGATIVE PROGRAM

CODE ED/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NSS STAFF	NOAA-NES
01 - W.E. SHENK	NASA-GSFC

BRIEF DESCRIPTION

THE VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR) FLOWN ON SMS 1 PROVIDED DAY/NIGHT OBSERVATIONS OF CLOUDCOVER AND EARTH/CLOUD RADIANCE TEMPERATURE MEASUREMENTS FROM A SYNCHRONOUS, SPIN-STABILIZED, GEOSTATIONARY SATELLITE FOR USE IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE TWO-CHANNEL INSTRUMENT WAS ABLE TO TAKE BOTH FULL AND PARTIAL PICTURES OF THE EARTH'S DISK. THE INFRARED CHANNEL (10.5 TO 12.6 MICRONS) AND THE VISIBLE CHANNEL (0.55 TO 0.70 MICRONS) USED A COMMON OPTICS SYSTEM. INCOMING RADIATION WAS RECEIVED BY AN ELLIPTICALLY-SHAPED SCAN MIRROR AND COLLECTED BY A RITCHIE-CRETIER OPTICAL SYSTEM. THE SCAN MIRROR WAS SET AT A NOMINAL ANGLE OF 45 DEG TO THE VISSR OPTICAL AXIS, WHICH WAS ALIGNED PARALLEL TO THE SPIN AXIS OF THE SPACECRAFT. THE SPINNING MOTION OF THE SPACECRAFT (APPROXIMATELY 100 RPM) PROVIDED A WEST-TO-EAST SCAN MOTION WHEN THE SPIN AXIS OF THE SPACECRAFT WAS ORIENTED PARALLEL WITH THE EARTH'S AXIS. THE LATITUDINAL SCAN WAS ACCOMPLISHED BY SEQUENTIALLY TILTING THE SCANNING MIRROR NORTH TO SOUTH AT THE COMPLETION OF EACH SPIN. A FULL PICTURE TOOK 18.2 MIN TO COMPLETE AND ABOUT 2 MIN TO RETRACE. DURING EACH SCAN, THE FIELD OF VIEW ON THE EARTH WAS SWEEPED BY A LINEAR ARRAY OF EIGHT VISIBLE-SPECTRUM DETECTORS, EACH WITH A GROUND RESOLUTION OF 0.9 KM AT ZERO HABIT ANGLE. A MERCURY-CAPRIUM TELLURIUM DETECTOR SENSED THE INFRARED PORTION OF THE SPECTRUM WITH A HORIZONTAL RESOLUTION OF APPROXIMATELY 8 KM AT ZERO HABIT ANGLE. THE INFRARED PORTION OF THE DETECTOR MEASURED RADIANCE TEMPERATURES BETWEEN 180 AND 315 DEG K WITH A PROPOSED SENSITIVITY BETWEEN 0.4 AND 1.4 DEG K. THE VISSR OUTPUT WAS DIGITIZED AND TRANSMITTED TO THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION (NOAA) COMMAND DATA ACQUISITION STATION (CDAS), WALELOPS ISLAND, VA. THERE THE SIGNAL WAS FED INTO A 'LINE STRETCHER' WHERE IT WAS STORED AND TIME-STRETCHED FOR TRANSMISSION BACK TO THE SATELLITE AT REDUCED BANDWIDTH FOR RE-BROADCAST TO DATA UTILIZATION STATIONS (DUS). THE VISSR DATA, AS WITH ALL OPERATIONAL TYPE DATA, WERE HANDLED BY NOAA AND THE MAJORITY OF DATA WERE ARCHIVED BY THE ENVIRONMENTAL DATA SERVICE, SATELLITE DATA SERVICE BRANCH, SUITLAND, MD. LIMITED AMOUNTS OF RESEARCH-ORIENTED DATA WERE COLLECTED BY NASA AND WERE MAINTAINED AT NSSDC.

----- SMS 1, NSS STAFF -----

INVESTIGATION NAME- METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM

NSSDC ID- 74-033A-05 INVESTIGATIVE PROGRAM

CODE ED/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NSS STAFF	NOAA-NES
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BRIEF DESCRIPTION

THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM WAS AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM DESIGNED TO RECEIVE AND PROCESS METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (COLLECTION) PLATFORMS (DCP). THE COLLECTED DATA WERE RETRANSMITTED FROM THE SATELLITE TO SMALL, GROUND-BASED, REGIONAL DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS COULD BE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWED FOR THE RETRANSMISSION OF NARROW-BAND (WETEX TYPE) DATA

ORIGINAL PAGE IS  
OF POOR QUALITY

TO EXISTING SMALL GROUND-BASED APR RECEIVING STATIONS FROM A LARGER WEATHER CENTRAL FACILITY. THIS COMMUNICATIONS SYSTEM OPERATED ON S-BAND FREQUENCIES. THE MINIMUM DATA COLLECTION SYSTEM FOR ONE SBS CONSISTED OF APPROXIMATELY 3500 DCP STATIONS TO BE CONTACTED IN A 6-M PERIOD. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6-M PERIOD WAS BETWEEN 350K AND 600K BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARIED FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT AN INDIVIDUAL DCP STATION.

----- SBS 1: WILLIAMS -----

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 74-033A-02      INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - D.J. WILLIAMS      NOAA-ERL

BRIEF DESCRIPTION

A NUMBER OF SEPARATE SILICON SOLID-STATE DETECTORS, EACH WITH A TAILORED MODERATOR THICKNESS AND A SEPARATE ELECTRONICS UNIT FOR PULSE AMPLIFICATION AND PULSE HEIGHT DISCRIMINATION, WERE USED TO OBTAIN THE FOLLOWING PARTICLE TYPE/ENERGY MEASUREMENTS -- SEVEN CHANNELS MEASURED PROTONS IN THE RANGE 1 TO 500 MEV, SIX CHANNELS MEASURED ALPHA PARTICLES IN THE RANGE 4 TO 400 MEV, AND ONE CHANNEL MEASURED ELECTRONS GREATER THAN 0.5 MEV.

----- SBS 1: WILLIAMS -----

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 74-033A-03      INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
  
INVESTIGATION DISCIPLINE(S)  
SCALAR PHYSICS

PERSONNEL  
PI - D.J. WILLIAMS      NOAA-ERL

BRIEF DESCRIPTION

THE X-RAY COUNTER WAS COMPOSED OF A COLLIMATOR, TWO IONIZATION CHAMBERS, AND TWO ELECTROMETERS. A SMALL ANGULAR APERTURE HAS BEEN CHOSEN FOR THE TELESCOPE COLLIMATOR, WHICH WAS MOUNTED SO THAT THE DECLINATION OF ITS AXIS CAN BE CONTROLLED BY GROUND COMMAND TO INSURE THAT THE SUN IS VIEWED BY THE TELESCOPE ONCE DURING EVERY VEHICLE ROTATION. ONE ION CHAMBER WAS FILLED WITH ARGON AT 1 ATM FOR DETECTION OF 1-70 K-B-A X RAYS, AND HAD A 1.27-μM BERYLLIUM WINDOW TO EXCLUDE X RAYS OF LONGER WAVELENGTHS. THE OTHER CHAMBER WAS FILLED WITH KERON AT 1.5 TO 2 ATM AND HAD A 1.27-μ-3M BERYLLIUM WINDOW FOR MEASUREMENTS OF X RAYS IN THE WAVELENGTH RANGE 0.5- TO 3-A.

----- SBS 1: WILLIAMS -----

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 74-033A-04      INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL  
PI - D.J. WILLIAMS      NOAA-ERL

BRIEF DESCRIPTION

A BIAXIAL, SHORT BOOM-MOUNTED (2 FT) CLOSED-LOOP, FLUIGATE MAGNETOMETER WAS ORIENTED WITH ONE AXIS ALONG THE S/C SPIN AXIS, AND ONE IN THE SPIN PLANE. EACH SENSOR HAD A SELECTABLE RANGE (450, 100, 200, OR 400 NT), AN OFFSET FIELD CAPABILITY (PLUS OR MINUS 1200 NT IN 40-NT STEPS), AND AN IN-FLIGHT CALIBRATION CAPABILITY.

\*\*\*\*\* SBS 2 \*\*\*\*\*

SPACECRAFT COMMON NAME- SBS 2  
ALTERNATE NAMES- PL-731E, SYNCH METEOROL SATELLITE  
SBS-2, ME82

NSSDC ID- 75-011A

LAUNCH DATE- 02/06/75      WEIGHT- 263. KG  
LAUNCH SITE- CAE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES      NOAA-NESS  
UNITED STATES      NASA-GSFC

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOSTATIONARY  
ORBIT PERIOD- 1436.2 MIN  
PERIASTRIS- 35778. KM ALT

EPHEM DATE- 04/01/75  
INCLINATION- 1.0 DEG  
APOAPSIS- 35799. KM ALT

PERSONNEL  
PI - T.J. KARRAS  
PS - W.E. SHENK

NOAA-NESS  
NASA-GSFC

BRIEF DESCRIPTION

THE SBS 2, A NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT, CARRIED (1) A VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR) TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA AND TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM; (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL APR-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTE EARTH-BASED PLATFORMS; AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PHOTON, ELECTRON, AND SOLAR X-RAY FLUXES AND MAGNETIC FIELDS. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS, AND CYLINDRICALLY SHAPED SPACECRAFT MEASURED 190.5 CM IN DIAM AND 230 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDED AN ADDITIONAL 85 CM BEYOND THE CYLINDER SHELL. THE PRIMARY STRUCTURAL MEMBERS WERE A HONEYCOMB EQUIPMENT SHELF AND A THRUST TUBE. THE VISSR TELESCOPE WAS MOUNTED ON THE EQUIPMENT SHELF AND VIEWED THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDED RADIALLY OUT FROM THE THRUST TUBE AND WAS AFFIRED TO THE SOLAR PANELS, WHICH FORMED THE OUTER WALLS OF THE SPACECRAFT. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS WERE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) WAS MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. BOTH UHF-BAND AND S-BAND FREQUENCIES WERE USED IN THE TELEMETRY AND COMMAND SUBSYSTEMS. A LOW-POWER VHF TRANSPODNER PROVIDED TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVED AS A BACKUP FOR THE PRIMARY SUBSYSTEM AFTER THE SYNCHRONOUS ORBIT WAS ATTAINED.

----- SBS 2: NESS STAFF -----

INVESTIGATION NAME- VISIBLE-INFRARED SPIN-SCAN RADIOMETER  
(VISSR)

NSSDC ID- 75-011A-04      INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER ONS  
  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF  
PS - W.E. SHENK

NOAA-NESS  
NASA-GSFC

BRIEF DESCRIPTION

THE VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR) FLOWN ON SBS 2 PROVIDED DAY/NIGHT OBSERVATIONS OF CLOUDCOVER AND EARTH/CLOUD RADIANCE TEMPERATURE MEASUREMENTS FROM A SYNCHRONOUS, SPIN-STABILIZED, GEOSTATIONARY SATELLITE FOR USE IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE TWO-CHANNEL INSTRUMENT WAS ABLE TO TAKE BOTH FULL AND PARTIAL PICTURES OF THE EARTH'S DISK. THE INFRARED CHANNEL (10.5 TO 12.6 MICRORAMETERS) AND THE VISIBLE CHANNEL (0.55 TO 0.70 MICRORAMETERS) USED A COMMON OPTICS SYSTEM. INCOMING RADIATION WAS RECEIVED BY AN ELLIPTICALLY-SHAPED SCAN MIRROR AND COLLECTED BY A RITCHIE-CRETIEEN OPTICAL SYSTEM. THE SCAN MIRROR WAS SET AT A NOMINAL ANGLE OF 45 DEG TO THE VISSR OPTICAL AXIS, WHICH WAS ALIGNED PARALLEL TO THE SPIN AXIS OF THE SPACECRAFT. THE SPINNING MOTION OF THE SPACECRAFT (APPROXIMATELY 100 RPM) PROVIDED A WEST-TO-EAST SCAN MOTION WHEN THE SPIN AXIS OF THE SPACECRAFT IS ORIENTED PARALLEL WITH THE EARTH'S AXIS. THE LATITUDINAL SCAN WAS ACCOMPLISHED BY SEQUENTIALLY TILTING THE SCANNING MIRROR NORTH TO SOUTH AT THE COMPLETION OF EACH SPIN. A FULL PICTURE TOOK 18.2 MIN TO COMPLETE AND ABOUT 2 MIN TO RETRACE. DURING EACH SCAN, THE FIELD OF VIEW ON THE EARTH WAS SWEEP BY A LINEAR ARRAY OF EIGHT VISIBLE-SPECTRUM DETECTORS, EACH WITH A GROUND RESOLUTION OF 0.9 KM AT ZERO HABIT ANGLE. A MERCURY-Cadmium Telluride DETECTOR SENSED THE INFRARED PORTION OF THE SPECTRUM WITH A HORIZONTAL RESOLUTION OF APPROXIMATELY 8 KM AT ZERO HABIT ANGLE. THE INFRARED PORTION OF THE DETECTOR MEASURED RADIANCE TEMPERATURES BETWEEN 180 AND 335 DEG K WITH A PROPOSED SENSITIVITY BETWEEN 0.4 AND 1.4 DEG K. THE VISSR OUTPUT WAS DIGITIZED AND TRANSMITTED TO THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION (NOAA) COMMAND DATA ACQUISITION STATION (CDAS), WALLOPS ISLANDS, VA. THERE THE SIGNAL WAS FED INTO A LINE STRETCHER WHERE IT WAS STORED AND TIME-STRETCHED FOR TRANSMISSION BACK TO THE SATELLITE AT REDUCED BANDWIDTH FOR RE-BROADCAST TO DATA UTILIZATION STATIONS (DUS). THE VISSR DATA, AS WITH ALL OPERATIONAL TYPE DATA, WERE HANDLED BY NOAA AND THE MAJORITY OF DATA WERE ARCHIVED BY THE ENVIRONMENTAL DATA SERVICE, SATELLITE DATA SERVICE BRANCH, SUITLAND, MD. LIMITED AMOUNTS OF RESEARCH-ORIENTED DATA WERE COLLECTED BY NASA AND WERE MAINTAINED AT NSSDC.

----- SMS 2: NESS STAFF-----

INVESTIGATION NAME- METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM

NSSDC ID- 75-011A-09 INVESTIGATIVE PROGRAM CODE ED/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS

PERSONNEL  
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM, AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM OPERATING ON S-BAND FREQUENCIES, RECEIVED AND PROCESSED METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (COLLECTION) PLATFORMS (DCP). THE COLLECTED DATA WAS RETRANSMITTED FROM THE SATELLITE TO SMALL-GROUND-BASED, REMOTE DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS WERE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWED FOR THE RETRANSMISSION OF NARROW-BAND (MEFAX TYPE) DATA TO EXISTING SMALL GROUND-BASED APT RECEIVING STATIONS FROM A LARGER WEATHER CENTRAL FACILITY. THE MINIMUM DATA COLLECTION FOR ONE SPACEROCK CONSISTED OF APPROXIMATELY 3000 DCP STATIONS CONTACTED IN 6 H. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6 H WAS BETWEEN 350K AND 600K BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARIED FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT THE DCP STATION.

----- SMS 2: WILLIAMS-----

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 75-011A-01 INVESTIGATIVE PROGRAM CODE ED/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - D.J. WILLIAMS NOAA-ERL

BRIEF DESCRIPTION

A NUMBER OF SEPARATE SILICON SOLID-STATE DETECTORS, EACH WITH A TAILORED MODERATOR THICKNESS AND A SEPARATE ELECTRONICS UNIT FOR PULSE AMPLIFICATION AND PULSE HEIGHT DISCRIMINATION, WERE USED TO OBTAIN THE FOLLOWING PARTICLE TYPE AND ENERGY MEASUREMENTS: - SEVEN CHANNELS MEASURE PROTONS IN THE RANGE 1 TO 300 MEV; SIX CHANNELS MEASURE ALPHA PARTICLES IN THE RANGE 4 TO 400 MEV; AND ONE CHANNEL MEASURES ELECTRONS GREATER THAN 0.5 MEV.

----- SMS 2: WILLIAMS-----

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 75-011A-02 INVESTIGATIVE PROGRAM CODE ED/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL  
PI - D.J. WILLIAMS NOAA-ERL

BRIEF DESCRIPTION

THE X-RAY COUNTER WAS COMPRISED OF A COLLIMATOR, TWO IONIZATION CHAMBERS, AND TWO ELECTROMETERS. A SMALL ANGULAR APERTURE WAS CHOSEN FOR THE TELESCOPE COLLIMATOR. THE COLLIMATOR, MOUNTED SO ITS AXIS DECLINATION WAS CONTROLLED BY GROUND COMMAND, VIEWED THE SUN ONCE EVERY VEHICLE ROTATION. ONE ION CHAMBER, FILLED WITH ARGON AT 1 ATM, DETECTED 1- TO 8-A X RAYS, AND HAD A 1.27E-4 M BERYLLIUM WINDOW TO EXCLUDE X RAYS OF LONGER WAVELENGTHS. THE OTHER CHAMBER WAS FILLED WITH NEON AT 3.5 TO 2 ATM AND HAD A 1.27E-3 M BERYLLIUM WINDOW TO MEASURE X RAYS OF 0.5 TO 3 A.

----- SMS 2: WILLIAMS-----

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 75-011A-03 INVESTIGATIVE PROGRAM CODE ED/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL  
PI - D.J. WILLIAMS NOAA-ERL

BRIEF DESCRIPTION

A SHORT BOOM DEPLOYED .61 M BIAXIAL, CLOSED-LOOP, FLUIGATE MAGNETOMETER WITH ONE SENSOR ALIGNED PARALLEL TO THE SPACECRAFT SPIN AXIS AND THE OTHER PERPENDICULAR TO THIS AXIS MEASURED THE VECTOR MAGNETIC FIELD, SELECTABLE RANGE (100, 1000, 2000, OR 4000 NT), AN OFFSET FIELD CAPABILITY (PLUS OR MINUS 1200 NT IN 60-NT STEPS), AND AN INFLIGHT CALIBRATION CAPABILITY.

----- SOLRAD 11B-----

SPACEROCK COMMON NAME- SOLRAD 11B

ALTERNATE NAMES- SOLRAD 11B-TRIP, SEDP P74-10  
SP74-10, SEDP NO. NBL-111-8260  
SBD-11B

NSSDC ID- 76-023D

LAUNCH DATE- 02/19/76 WEIGHT- 282.35 KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-NAVY

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/01/76  
ORBIT PERIOD- 7336.7 MIN INCLINATION- 29.6 DEG  
PERIAPSIS- 115720. KM ALT APOAPSIS- 116649. KM ALT

PERSONNEL  
PI - R.W. KREPLIN US NAVAL RESEARCH LAB  
PI - R.W. KREPLIN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION  
SOLRAD 11B WAS ONE OF A PAIR OF IDENTICAL SATELLITES THAT WERE PLACED IN A CIRCULAR EQUATORIAL ORBIT OF 20 EARTH RADII. THE SATELLITES, WHICH WERE ORIENTED TOWARDS THE SUN, PROVIDED 100 PERCENT REAL-TIME, CONTINUOUS MONITORING OF SOLAR X-RAY, UV, AND ENERGETIC PARTICLE EMISSIONS. EXPERIMENTS INCLUDED BROADBAND ION CHAMBERS OBSERVING SOLAR X-RAYS BETWEEN 0.1 AND 60 A, PROPORTIONAL COUNTERS AND SCINTILLATORS OBSERVING SOLAR X-RAYS BETWEEN 2 AND 150 KEV, AN EUV DETECTOR COVERING THREE BANDS BETWEEN 170 AND 1000 A, A VARIABLE RESOLUTION BERTH-PASTIE SPECTROMETER COVERING THE WAVELENGTH RANGE OF 1100 TO 1600 A (RESOLUTION -- 1 TO 25 A), A SOLAR WIND MONITOR, SOLAR PROTON, ELECTRON, AND ALPHA PARTICLE MONITORS, TWO X-RAY POLARIMETERS (ONE UTILIZING BRAGG SCATTERING AND THE OTHER UTILIZING THOMSON SCATTERING), A BRAGG SPECTROMETER OBSERVING MAGNESIUM-24 AND -22 LINES, A LARGE-AREA AURORAL X-RAY DETECTOR, AND A PASSIVELY COOLED SOLID-STATE X-RAY DETECTOR TO MEASURE BACKGROUND X-RAY EMISSIONS.

----- SOLRAD 11B: KREPLIN-----

INVESTIGATION NAME- 1- TO 8-A SOLAR X-RAY MONITOR

NSSDC ID- 76-023D-04 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
X-RAY ASTRONOMY

PERSONNEL  
PI - R.W. KREPLIN US NAVAL RESEARCH LAB  
OI - R.S. TAYLOR US NAVAL RESEARCH LAB  
OI - D.P. MORAN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION  
THIS EXPERIMENT CONSISTED OF TWO COMPLETE SETS OF IONIZATION-CHAMBER AND ELECTROMETER-AMPLIFIER COMBINATIONS. THE IONIZATION CHAMBERS WERE SENSITIVE TO SOLAR X-RAYS IN THE 1- TO 8-A RANGE. THE TWO SETS WERE DRIVEN BY SEPARATE POWER SUPPLIES. ALTHOUGH ONLY ONE SET WAS SELECTED FOR TELEMETRY TRANSMISSION, DATA WERE TRANSMITTED WITH A 15-S TIME RESOLUTION. THE ELECTROMETER-AMPLIFIERS WERE ABLE TO CHANGE RANGES AUTOMATICALLY OR MANUALLY. THE DETECTORS COULD NOT BE CALIBRATED IN FLIGHT, BUT THE ELECTROMETER-AMP COULD BE CALIBRATED ON EACH RANGE WITHOUT DETACHING THE DETECTOR.

----- SOLRAD 11B: KREPLIN-----

INVESTIGATION NAME- 8- TO 16-A SOLAR X-RAY MONITOR

NSSDC ID- 76-023D-05 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
PARTICLE ASTROPHYSICS  
X-RAY PHYSICS

PERSONNEL  
PI - R.W. KREPLIN US NAVAL RESEARCH LAB  
OI - R.S. TAYLOR US NAVAL RESEARCH LAB  
OI - D.P. MORAN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION  
THIS EXPERIMENT CONSISTED OF TWO COMPLETE SETS OF IONIZATION-CHAMBER AND ELECTROMETER-AMPLIFIER COMBINATIONS. THE IONIZATION CHAMBERS WERE SENSITIVE TO SOLAR X-RAYS IN THE 8- TO 16-A RANGE. THE TWO SETS WERE DRIVEN BY SEPARATE POWER SUPPLIES. ALTHOUGH ONLY ONE SET WAS SELECTED FOR TELEMETRY TRANSMISSION, DATA WERE TRANSMITTED WITH A 20-S TIME RESOLUTION. THE ELECTROMETER-AMPLIFIERS WERE ABLE TO CHANGE RANGES AUTOMATICALLY OR MANUALLY. THE DETECTORS COULD NOT BE CALIBRATED IN FLIGHT, BUT THE ELECTROMETER-AMPLIFIERS COULD BE CALIBRATED ON EACH RANGE WITHOUT DETACHING THE DETECTOR.

----- SOLRAD 11B, KREPLIN -----

INVESTIGATION NAME- 44- TO 60-A SOLAR X-RAY MONITOR

NSSDC ID- 76-0230-06

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
X-RAY ASTRONOMY

PERSONNEL

PI - R.W. KREPLIN  
OI - D.M. HORAN  
OI - R.G. TAYLOR

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF TWO COMPLETE SETS OF IONIZATION-CHAMBER AND ELECTROMETER-AMPLIFIER COMBINATIONS. THE IONIZATION CHAMBERS WERE SENSITIVE TO SOLAR X RAYS IN THE 44- TO 60-A RANGE. THE TWO SETS WERE DRIVEN BY SEPARATE POWER SUPPLIES, ALTHOUGH ONLY ONE SET WAS SELECTED FOR TELEMETRY TRANSMISSION. DATA WERE TRANSMITTED WITH A 30-S TIME RESOLUTION. THE ELECTROMETER-AMPLIFIERS WERE ABLE TO CHANGE CURRENT RANGES AUTOMATICALLY OR MANUALLY. THE ELECTROMETER-AMPLIFIERS COULD BE CALIBRATED ON EACH RANGE WITHOUT DETACHING THE DETECTOR. THE DETECTORS COULD BE CALIBRATED IN FLIGHT BY COMMANDING A SHUTTER-MOUNTED RADIOACTIVE SOURCE INTO POSITION.

----- SOLRAD 11B, KREPLIN -----

INVESTIGATION NAME- 170- TO 1050-A SOLAR EUV MONITOR

NSSDC ID- 76-0230-07

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - R.W. KREPLIN  
OI - R.G. TAYLOR  
OI - D.M. HORAN

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF THREE SETS OF LITHIUM FLUORIDE PHOTOSENSITIVE SURFACE DETECTORS COUPLED TO FOUR-RANGE ELECTROMETER-AMPLIFIERS. THE THREE SETS WERE NOT REDUNDANT DUE TO THE DIFFERENT FILTERS BEING USED. A BERYLLIUM FILTER LIMITED ONE DETECTOR'S RESPONSE TO WAVELENGTHS FROM 170 TO 500 A. A TIN FILTER LIMITED A SECOND DETECTOR'S RESPONSE TO WAVELENGTHS FROM 450 TO 850 A. AN INDIUM FILTER LIMITED THE THIRD DETECTOR'S RESPONSE TO WAVELENGTHS FROM 725 TO 1050 A. THE DETECTOR-ELECTROMETER SETS WERE DRIVEN BY SEPARATE POWER SUPPLIES. EACH DETECTOR WAS READ EVERY 7.5 S. THE ELECTROMETERS COULD BE CALIBRATED DURING FLIGHT WITHOUT DETACHING THE DETECTOR, ALTHOUGH THE DETECTORS COULD NOT BE CALIBRATED IN FLIGHT.

----- SOLRAD 11B, KREPLIN -----

INVESTIGATION NAME- 0.5- TO 3-A SOLAR X-RAY MONITOR

NSSDC ID- 76-0230-12

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
X-RAY ASTRONOMY

PERSONNEL

PI - R.W. KREPLIN  
OI - R.G. TAYLOR  
OI - D.M. HORAN

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF THREE IONIZATION CHAMBERS CONNECTED IN PARALLEL TO A SINGLE ELECTROMETER-AMPLIFIER. THE IONIZATION CHAMBERS WERE SENSITIVE TO SOLAR X RAYS IN THE 0.5- TO 3.0-A RANGE. DATA WERE TRANSMITTED WITH A 15-S TIME RESOLUTION. THE ELECTROMETER-AMPLIFIER WAS ABLE TO CHANGE CURRENT RANGES AUTOMATICALLY OR MANUALLY. THE DETECTORS COULD NOT BE CALIBRATED IN FLIGHT, BUT THE ELECTROMETER-AMPLIFIER COULD BE CALIBRATED ON EACH RANGE WITHOUT DETACHING THE DETECTOR.

----- SOLRAD 11B, KREPLIN -----

INVESTIGATION NAME- 2- TO 10-A SOLAR X-RAY MONITOR

NSSDC ID- 76-0230-13

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
X-RAY ASTRONOMY

PERSONNEL

PI - R.W. KREPLIN  
OI - R.G. TAYLOR  
OI - D.M. HORAN

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF AN IONIZATION CHAMBER AND ONE ELECTROMETER-AMPLIFIER. THE IONIZATION CHAMBER WAS SENSITIVE TO SOLAR X RAYS IN THE 2- TO 20-A RANGE. DATA WERE TRANSMITTED WITH A 30-S TIME RESOLUTION. THE ELECTROMETER-AMPLIFIER WAS ABLE TO CHANGE CURRENT RANGES AUTOMATICALLY OR MANUALLY. THE DETECTOR COULD NOT BE CALIBRATED IN FLIGHT, BUT THE ELECTROMETER-AMPLIFIER COULD BE CALIBRATED ON EACH RANGE WITHOUT DETACHING THE DETECTOR.

----- SOLRAD 11B, MEKINS -----

INVESTIGATION NAME- CONTINUUM (8.8 A) AND MAGNESIUM LINE (9.17 A AND 8.42 A) MONITOR

NSSDC ID- 76-0230-03

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
X-RAY ASTRONOMY

PERSONNEL

PI - J.F. MEKINS

US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

SOLAR X RAYS WERE OBSERVED IN THE MAGNESIUM-11 AND -12 LINES (9.17 A AND 8.42 A) AND IN THE CONTINUUM AT 8.8 A. THREE SiA CRYSTALS FIXED AT THREE DIFFERENT ANGLES ALLOWED SOLAR X RAYS TO UNDERGO FIRST-ORDER BRAGG REFLECTION INTO THREE PROPORTIONAL COUNTERS. IF THE SPACECRAFT SPIN AXIS HAD BECOME IMPROPERLY ORIENTED, THE SPECTROMETER WOULD HAVE FUNCTIONED PROPERLY IF THE ASPECT ANGLE HAD BEEN NO MORE THAN 1 DEG OFF NOMINAL, ALTHOUGH THE INSTRUMENT WOULD THEN HAVE FUNCTIONED AS A SCANNING SPECTROMETER WITH AN EXTREMELY SMALL SPECTRAL RANGE IN THE VICINITY OF THE TARGET WAVELENGTHS. DATA WERE ACCUMULATED OVER INTERVALS OF 1/64 OF A SPACECRAFT'S SPIN PERIOD, AND THE EXPERIMENT HAD A SAMPLING CYCLE OF APPROXIMATELY 1-MIN DURATION.

\*\*\*\*\* STP P78-1 \*\*\*\*\*

SPACECRAFT COMMON NAME- STP P78-1

ALTERNATE NAMES- SPACE TEST PROGRAM P78-1, P78-1  
11278, SOLWIND  
SOLWIND

NSSDC ID- 79-017A

LAUNCH DATE- 02/24/79

WEIGHT- 849.6 KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

1-INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 96.3 MIN  
PERIAPSIS- 560. KM ALT

EPOCH DATE- 02/24/79  
INCLINATION- 97.9 DEG  
APOAPSIS- 600. KM ALT

PERSONNEL

PM - W. WALKER

USAF SPACE DIVISION

PS - J.R. STEVENS

AEROSPACE CORP

BRIEF DESCRIPTION

THE SPACE TEST PROGRAM (STP) P78-1 MISSION WAS DESIGNED TO OBTAIN SCIENTIFIC DATA FROM EARTH AND SUN-ORIENTED EXPERIMENTS. THE SPACECRAFT WAS SUN-ORIENTED AND HAD ITS SPIN AXIS PERPENDICULAR TO THE ORBIT PLANE AND THE SATELLITE-SUN LINE. THE INSTRUMENTATION CONSISTED OF (1) A GAMMA-RAY SPECTROMETER AND PARTICLE DETECTORS, (2) A WHITE-LIGHT CORONAGRAPH AND AN EXTREME-ULTRAVIOLET (XUV) HELIOGRAPH, (3) SOLAR X-RAY SPECTROMETER AND SPECTROHELIOPHOTOGRAPH, (4) AN EXTREME-ULTRAVIOLET (XUV) SPECTROMETER, (5) A HIGH-LATITUDE PARTICLE SPECTROMETER, (6) AN X-RAY MONITOR, AND (7) A PRELIMINARY AEROSOL MONITOR.

----- STP P78-1, BOWYER -----

INVESTIGATION NAME- EXTREME ULTRAVIOLET SPECTROMETER

NSSDC ID- 79-017A-04

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - C.S. BOWYER

U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED A EXTREME ULTRAVIOLET (EUV) SPECTROMETER TO MEASURE AIRBLOW RADIATION IN THE UPPER ATMOSPHERE. THE INSTRUMENT HAD A 6 DEG BY 6 DEG FIELD OF VIEW AND COULD MEASURE A SELECTED 600 Å BANDWIDTH WITH 5 Å RESOLUTION WITHIN THE 200 - 1400 Å RANGE.

**----- STP P78-1, INHOF -----****INVESTIGATION NAME- GAMMA RAY SPECTROMETER**

NSSDC ID- 79-017A-01

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY**PERSONNEL**

PI - W.L. INHOF

LOCKHEED PALO ALTO

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED GAMMA-RAY SPECTROMETERS TO MEASURE THE DISTRIBUTION OF GAMMA-RAY SOURCES AND THE CHARACTERISTICS OF ENERGETIC PARTICLE FLUXES AT LOW ALTITUDES. THE INSTRUMENT CONSISTED OF THREE DIFFERENT TYPES OF DETECTORS. THERE WERE TWO GE DETECTORS, COOLED BY A MECHANICAL REFRIGERATOR, TWO CsI/PLASTIC PHOSWICH DETECTORS, AND AN ARRAY OF EIGHT Cd Te DETECTORS. GE DETECTORS HAD A CONICAL FIELD OF VIEW (FOV) OF 45 DEG HALF ANGLE, WAS 80 CU CM IN VOLUME AND 15 SQ CM IN FRONT AREA AND MEASURED ENERGY LOSS FROM 40 KEV TO 2.5 MEV IN 4096 CHANNELS. A FACTOR OF 3 GAIN CHANGE ALLOWED THE RANGE TO CHANGE TO 0.12 TO 7.5 MEV. THE INITIAL ENERGY RESOLUTION WAS 3.5 KEV AT 1 MEV BUT DUE TO RADIATION DAMAGE AND TEMPERATURE CYCLING CAUSED BY THE NECESSITY TO TURN OFF THE REFRIGERATOR FOR POWER CONSERVATION, THE RESOLUTION DEGRADED TO ABOUT 40 KEV AT THE 0.511 MEV LINE. THE PHOSWICH DETECTORS WERE 10.16 CM (4 IN.) DIAMETER DISKS OF 1.27 CM (0.5 IN.) THICKNESS AND MEASURED ENERGY LOSS FROM 40 KEV TO 2.5 MEV IN 256 CHANNELS. THE Cd Te DETECTORS HAD A FAN SHAPED FOV OF 90 DEG BY 10 DEG AND WERE EQUALLY SPACED IN THE 10 DEG WIDTHS ARE THE CIRCLE. THE ENERGY LOSS RANGE WAS 20 - 200 KEV IN 6 CHANNELS.

**----- STP P78-1, LANDECKER -----****INVESTIGATION NAME- SOLAR X-RAY SPECTROMETER**

NSSDC ID- 79-017A-03

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
SCALAR PHYSICS**PERSONNEL**PI - P.B. LANDECKER  
PI - R.W. KREPLIN  
OI - D.L. MCKENZIE  
OI - G.A. DOSCHEKAEROSPACE CORP  
US NAVAL RESEARCH LAB  
AEROSPACE CORP  
US NAVAL RESEARCH LAB**BRIEF DESCRIPTION**

THIS INVESTIGATION WAS COMPRISED OF 4 PARTS: SOLEX, SOLFLEX, MONEX, AND MAGMAP. THE OBJECTIVE OF THESE 4 EXPERIMENTS WAS THE STUDY OF SOLAR FLARES AND ACTIVE REGIONS. SOLEX OBTAINED SPECTRA IN THE 3 TO 25 Å WAVELENGTH INTERVAL WHILE POINTED AT A SPECIFIC SOLAR REGION AS WELL AS MAPS OF THE SUN IN INDIVIDUAL X-RAY SPECTRAL LINES USING MULTIGRID COLLIMATORS AND BRAGG CRYSTAL SPECTROMETERS. SOLFLEX OBTAINED FLARE SPECTRA IN 4 NARROW WAVELENGTH BANDS BETWEEN 1.8 AND 8.6 Å USING UNCOLLIMATED BRAGG CRYSTAL SPECTROMETERS. MONEX RECORDED FULL SOLAR DISK INTENSITY WITH 32 msec TIME RESOLUTION FROM 0.1 TO 12 Å USING UNCOLLIMATED PROPORTIONAL COUNTERS. MAGMAP OBTAINED FULL DISK SOLAR MAPS FROM 8 TO 12 Å USING FILTERED COLLIMATED PROPORTIONAL COUNTERS.

**----- STP P78-1, MICHELS -----****INVESTIGATION NAME- SOLAR WIND MONITOR**

NSSDC ID- 79-017A-02

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
SOLAR PHYSICS**PERSONNEL**

PI - D.J. MICHELS

US NAVAL RESEARCH LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED A WHITE LIGHT CORONAGRAPH AND AN EXTREME ULTRAVIOLET (EUV) HELIOGRAPH TO MONITOR THE SUN'S INNER AND OUTER CORONA. THE PURPOSE OF THE INVESTIGATION WAS TO DETERMINE THE CHARACTER OF THE PLASMA OUTFLOW AT THE SOURCE OF THE SOLAR WIND. THE INVESTIGATION ALSO MEASURED THE FORM AND STRUCTURE OF SOLAR FLARES, CORONAL HOLES, AND ALFVEN WAVES. DUE TO BACKGROUND LIGHT PROBLEMS THE EUV HELIOGRAPH DATA WAS COMPLETELY COMPROMISED.

**----- STP P78-1, PEPIN -----****INVESTIGATION NAME- PRELIMINARY AEROSOL MONITOR**

NSSDC ID- 79-017A-07

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS**PERSONNEL**

PI - T.J. PEPIN

U OF WYOMING

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES AN AEROSOL MONITORING INSTRUMENT TO MEASURE THE CONCENTRATION AND VERTICAL DISTRIBUTION OF AEROSOLS AND OZONE IN THE EARTH'S STRATOSPHERE.

**----- STP P78-1, SHULMAN -----****INVESTIGATION NAME- X-RAY MONITOR**

NSSDC ID- 79-017A-06

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY**PERSONNEL**

PI - S.D. SHULMAN

US NAVAL RESEARCH LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED AN X-RAY MONITOR TO DETERMINE THE FREQUENCY AND LOCATION OF SHORT-LIVED X-RAY BURSTS FROM SPACE. IT PROVIDED A LOW RESOLUTION MAPPING CAPABILITY FOR AURORAL X-RAY EMISSION.

**----- STP P78-1, VANCOUR -----****INVESTIGATION NAME- HIGH LATITUDE PARTICLE SPECTROMETER**

NSSDC ID- 79-017A-05

INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAMINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS  
MAGNETOSPHERIC PHYSICS**PERSONNEL**

PI - R.P. VANCOUR

USAF GEOPHYS LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION USED TWO SETS OF DUAL ELECTROSTATIC ANALYZERS AT RIGHT ANGLES ACQUIRE ELECTRON DATA IN HIGH LATITUDE AURORAL ZONES, PRIMARILY DURING MAGNETIC STORM AND SUBSTORM PERIODS. THE ANALYZER IN EACH SET SWEEPS THROUGH ENERGY RANGE 50 - 1000 EV SIMULTANEOUSLY, THEN THE OTHER ANALYZER IN EACH SET SWEEPS FROM 1 - 20 KEV SIMULTANEOUSLY. THE TOTAL ENERGY RANGE 0.05 - 20 KEV IS DIVIDED INTO 16 CHANNELS.

\*\*\*\*\* STP P78-2\*\*\*\*\*

SPACECRAFT COMMON NAME- STP P78-2  
ALTERNATE NAMES- SESP P78-2A, P78-2  
SCATHA, 11256

NSSDC ID- 79-007A

LAUNCH DATE- 01/30/79  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA  
WEIGHT- 343. KGSPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAFINITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 794.8 MIN  
PERIAPSIS- 184. KM ALT  
EPOCH DATE- 02/01/79  
INCLINATION- 27.4 DEG  
APOAPSIS- 43905. KM ALT**PERSONNEL**

PM - J.C. DURR

USAF SPACE DIVISION

**BRIEF DESCRIPTION**

SPACECRAFT CHARGING AT HIGH ALTITUDES (SCATHA) WAS A SATELLITE PROGRAM FOR MEASURING THE CHARACTERISTICS OF THE PLASMASHEATH CHARGING PROCESS. THIS PROGRAM DETERMINED THE RESPONSE OF THE SATELLITE TO THIS CHARGING AND EVALUATED THE TECHNIQUES TO CORRECT THE PROBLEM. THE SPACECRAFT IS ESSENTIALLY A RIGHT CIRCULAR CYLINDER, 1.7 M IN DIAMETER AND 1.8 M HIGH. IT HAD A NEAR SYNCHRONOUS ORBIT AND SPUN ABOUT THE CYLINDER AXIS AT A RATE OF 1 RPM. THE SPIN VECTOR WAS NORMAL TO THE EARTH-SUN LINE AND IN THE EQUATORIAL PLANE OF THE EARTH. THERE WERE THREE 3-M BOOMS, A 2-M AND A 7-M BOOM ALL FOR DEPLOYMENT OF EXPERIMENTS. IN ADDITION THERE WAS A 100-M TIP-TO-TIP ELECTRIC FIELD ANTENNA. TELEMETRY CAPABILITY WAS BOTH PCM AND FM AND DATA COULD BE STORED UP TO 12 HOURS USING ON-BOARD TAPE RECORDERS. MISSION LIFE WAS ONE YEAR WITH POSSIBLE EXTENSION.

ORIGINAL PAGE IS  
OF POOR QUALITY





NSSDC ID- 78-069A-01

INVESTIGATIVE PROGRAM  
NAVIGATION TECHNOLOGY  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.A. POTERRA

APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A TRIAXIAL FLUXGATE MAGNETOMETER DESIGNED TO MEASURE VECTOR FIELDS WITH MAGNITUDES UP TO 50,000 NT. MEASUREMENTS WERE MADE BY SAMPLING EACH AXIS SEQUENTIALLY AT A RATE OF 2.25 SAMPLES/S. DIGITIZATION RESOLUTION WAS ABOUT 10 NT AS GIVEN BY A 13-BIT ANALOG TO DIGITAL CONVERTER, BUT ZERO-LEVEL DRIFTS WERE NOT READILY CHECKED. AS SUCH, THE EXPERIMENT WAS MOST USEFUL IN STUDIES OF MAGNETIC FLUCTUATIONS. DUE TO THE REAL-TIME DATA TRANSMISSION AND THE LOCATIONS OF THE TRACKING STATIONS, MOST OF THE DATA OBTAINED RELATED TO NORTHERN AND SOUTHERN HEMISPHERE HIGH LATITUDES.

\*\*\*\*\* TIROS-N \*\*\*\*\*

SPACECRAFT COMMON NAME- TIROS-N  
ALTERNATE NAMES- 11060

NSSDC ID- 78-096A

LAUNCH DATE- 10/13/78 WEIGHT- 588.9 KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY

UNITED STATES NOAA-NESS  
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/14/78  
ORBIT PERIOD- 102. MIN INCLINATION- 98.9 DEG  
PERIAPSIS- 846. KM ALT APOAPSIS- 862. KM ALT

PERSONNEL

MG - R. ARNOLD  
PM - J. FULLER, JR.

NASA HEADQUARTERS  
NASA-GSFC

BRIEF DESCRIPTION

TIROS-N WAS AN OPERATIONAL METEOROLOGICAL SATELLITE FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND SUPPORTED THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDED AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDED AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSISTED OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSED AND RELAYED TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE WAS BASED UPON THE BLOCK SD SPACECRAFT BUS DEVELOPED FOR THE US AIR FORCE, AND WAS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S.

\*\*\*\*\* TIROS-N, NESS STAFF \*\*\*\*\*

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 78-096A-01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE TIROS-N ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) WAS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA WERE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATED IN THE SCANNING MODE AND MEASURED EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS: CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRUMETER, CHANNEL 2 (NEAR IR), 0.725 MICRUMETER TO DETECTOR CUT OFF AROUND 1.3 MICRUMETERS, CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRUMETERS, AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.93 MICRUMETERS. ALL FOUR CHANNELS HAD A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAD A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR WAS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA WERE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH

(1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD WERE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDED GLOBAL AREA COVERAGE (GAC) DATA, HAD A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINED DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS WERE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

\*\*\*\*\* TIROS-N, NESS STAFF \*\*\*\*\*

INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER

NSSDC ID- 78-096A-02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE TIROS-N OPERATIONAL SOUNDER CONSISTED OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE HIGH RESOLUTION INFRARED SPECTROMETER (HIRS/2), HAD 20 CHANNELS AND MADE MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS: CHANNEL 1 - THE 3.7-MICRUMETER WINDOW REGION, CHANNEL 2 - THE 4.3-MICRUMETER CO<sub>2</sub> BAND, CHANNEL 3 - THE 9.7-MICRUMETER OZONE BAND, CHANNEL 4 - THE 11.1-MICRUMETER WINDOW REGION, CHANNELS 5 THROUGH 11 - THE 15-MICRUMETER CO<sub>2</sub> BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 14 - THE 18-MICRUMETER ROTATIONAL WATER VAPOR BANDS (18.8, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAD THREE CHANNELS OPERATING AT 14.97 MICRUMETERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE MODULATED CELLS CONTAINING CO<sub>2</sub>. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAD FOUR CHANNELS OPERATING IN THE 50 TO 60 GHZ OXYGEN BAND (50.3, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS WERE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS WERE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

\*\*\*\*\* TIROS-N, NESS STAFF \*\*\*\*\*

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-096A-03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON TIROS-N WAS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVED LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS WERE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL WAS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS WAS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAD THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS WERE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

\*\*\*\*\* TIROS-N, WILLIAMS \*\*\*\*\*

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- 78-096A-04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS

01 - R. SEAL

NOAA-ERL

NOAA-ERL

BRIEF DESCRIPTION

THIS EXPERIMENT WAS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE ITCS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTED OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURED IN FIVE ENERGY RANGES BOTH PHOTONS BETWEEN 150 KEV AND 40 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 25 MEV/N. THERE WERE TWO LEPATs VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURED PROTONS

ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAD A 50-DEG VIEWING CONE, VIEWED IN THE ANTI-EARTH DIRECTION, AND MEASURED PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURED TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* UK \*\*\*\*\*

SPACECRAFT COMMON NAME- UK 5  
ALTERNATE NAMES- UNITED KINGDOM-5, PL-7328  
ARIEL 5

NSSDC ID- 74-077A

LAUNCH DATE- 10/15/74 WEIGHT- 135. KG  
LAUNCH SITE- SAN MARCO PLATFORM, OFF COAST OF KENYA  
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY

UNITED KINGDOM	SRC
UNITED STATES	NASA-GSFC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/16/74
ORBIT PERIOD- 93.3 MIN	INCLINATION- 2.9 DEG
PERIAPSIS- 512.0 KM ALT	APOAPSIS- 557.0 KM ALT

PERSONNEL

PI - J.R. HOLTZ	NASA HEADQUARTERS
SC - N.G. ROMAN	NASA HEADQUARTERS
PM - J.P. CORRIGAN	NASA-GSFC
PS - S.S. HOLT	NASA-GSFC

BRIEF DESCRIPTION

THE UK 5 SPACECRAFT WAS DESIGNED TO CARRY SIX EXPERIMENTS THAT MEASURE THE SPECTRA, POLARIZATION, AND PULSAR FEATURES OF NONSOLAR X-RAY SOURCES. THE SPACECRAFT WAS SPIN STABILIZED, AND TWO EXPERIMENTS SCANNED THE SKY PERPENDICULAR TO THE SPIN AXIS, WHILE FOUR EXPERIMENTS POINTED PARALLEL TO THE SPIN AXIS. DATA WERE STORED ON BOARD THE SPACECRAFT IN A CORE STORAGE AND DUMPED TO GROUND STATIONS ONCE PER ORBIT.

----- UK 5, BOYD -----

INVESTIGATION NAME- 0.3- TO 30-KEV COSMIC X RAY WITH A ROTATION COLLIMATOR

NSSDC ID- 74-077A-01

INVESTIGATIVE PROGRAM  
CCBE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R.L.F. BOYD	U COLLEGE LONDON
OI - A.P. WILLMORE	U OF BIRMINGHAM
OI - P.W. SANFORD	U COLLEGE LONDON

BRIEF DESCRIPTION

THIS EXPERIMENT COMBINED THE FUNCTION OF OBSERVING X-RAYS IN DIFFERENT ENERGY RANGES WITH THAT OF STAR TRACKING. THE EXPERIMENT CONTAINED A ROTATION COLLIMATOR, UTILIZING THE SATELLITE SPIN, BEHIND WHICH THERE WERE THREE DETECTORS. THE FIELD OF VIEW WAS A CONE WITH A SEPI-ANGLE OF 10 DEG TO 20 DEG, DEPENDING ON THE TYPE OF RADIATION VIEWED BY THE DIFFERENT DETECTORS. THE FIRST DETECTOR WAS A VISIBLE-LIGHT PHOTOMULTIPLIER THAT ENABLED THE SPIN AXIS TO BE ACCURATELY DETERMINED BY VIEWING THE BACKGROUND OF OPTICAL STARS. SECONDLY, THERE WAS AN ARRAY OF CHANNEL ELECTRON MULTIPLIERS, WITH SELECTABLE FILTERS, COVERING THE WAVELENGTH RANGE 0.3 TO 6 KEV. THIRDLY, THERE WAS A GROUP OF PROPORTIONAL COUNTERS COVERING THE RANGE 2.5 TO 30 KEV. IT WAS ESTIMATED THAT SOURCE POSITIONS COULD BE DETERMINED TO WITHIN 2 ARC MIN FOR BRIGHT SOURCES.

----- UK 5, BOYD -----

INVESTIGATION NAME- HIGH-RESOLUTION SOURCE SPECTRA

NSSDC ID- 74-077A-03

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R.L.F. BOYD	U COLLEGE LONDON
OI - A.P. WILLMORE	U OF BIRMINGHAM
OI - P.W. SANFORD	U COLLEGE LONDON

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A HIGH-RESOLUTION, PROPORTIONAL-COUNTER SPECTROMETER WITH A 128-CHANNEL PULSE-HEIGHT ANALYZER, AND RESPONDED TO PHOTONS IN THE 2- TO 30-KEV ENERGY RANGE. THE SPECTRA OF SOURCES WERE EXAMINED IN GREATER DETAIL THAN HAD BEEN PREVIOUSLY POSSIBLE. LINE EMISSION FOR CERTAIN ELEMENTS (E.G., IRON) COULD ALSO BE IDENTIFIED. THE DETECTOR VIEWED IN A DIRECTION PARALLEL TO THE SPIN AXIS AND, THEREFORE, CONTINUED TO OBSERVE THE SAME PIECE OF SKY FOR AS LONG AS THE POSITION OF THE SATELLITE SPIN AXIS REMAINED UNALTERED. THE EXPERIMENT AXIS POINTED APPROXIMATELY

2 DEG OFF THE SPIN AXIS, SO THAT WHEN OBSERVING A SOURCE ALSO 2 DEG OFF THE SPIN AXIS THE SOURCE PASSED IN AND OUT OF THE FIELD OF VIEW DURING EACH ROTATION. THIS PERMITTED THE BACKGROUND FLUX TO BE SAMPLED EVERY SPIN PERIOD BY RECORDING THE SPECTRAL INFORMATION IN FOUR SETS OF LOCATIONS, EACH CORRESPONDING TO A QUADRANT OF THE SPIN CYCLE. THIS SHOULD HAVE OVERCOME THE LACK OF INFORMATION OF POSSIBLE FLUCTUATIONS IN THE BACKGROUND FLUX DURING AN ORBIT'S INTEGRATION. THE EXPERIMENT COULD ALSO HAVE BEEN OPERATED IN A MODE IN WHICH PERIODICITIES IN THE RANGE TYPICAL OF PULSTAR FREQUENCIES WERE DETECTED.

----- UK 5, ELLIOT -----

INVESTIGATION NAME- HIGH-ENERGY COSMIC X-RAY SPECTRA

NSSDC ID- 74-077A-05

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - H. ELLIOT	IMPERIAL COLLEGE
OI - J.J. QUENBY	IMPERIAL COLLEGE
OI - A.R. ENGEL	IMPERIAL COLLEGE

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO EXTEND THE SPECTRAL INFORMATION ON SELECTED X-RAY SOURCES IN THE ENERGY REGION ABOVE 20 KEV. MEASUREMENTS WERE POSSIBLE UP TO 2 REV, ALTHOUGH THE EFFICIENCY OF THE DETECTOR FELL STEEPLY AT THIS ENERGY. THE DETECTOR AXIS WAS INCLINED A FEW DEG WITH RESPECT TO THE SATELLITE SPIN AXIS SO THAT IT CONED AS THE SATELLITE SPUN. THE COUNTING RATE RESULTING FROM A POINT SOURCE A FEW DEG FROM THE SPIN AXIS WAS THUS MODULATED WITH THE SPIN PERIOD. THIS MODULATION WAS DETECTED BY DIVIDING THE SPIN CYCLE INTO FOUR SECTORS AND ANALYZING THE DIFFERENT COUNTING RATES IN EACH. IN THIS WAY, THE SOURCE INTENSITY COULD BE DETERMINED FROM THE AMPLITUDE OF THE MODULATION. FOR PULSTAR OBSERVATIONS, A LARGE ENERGY WINDOW AT THE LOWER END OF THE DETECTOR RANGE WAS USED. THE OBSERVATIONS IN THIS ENERGY REGION WERE ANALYZED FOR A PULSTAR PERIODICITY IN A SPECIAL SYSTEM THAT WAS PART OF THE SPACECRAFT HANDLING ELECTRONICS.

----- UK 5, HOLT -----

INVESTIGATION NAME- ALL-SKY MONITOR

NSSDC ID- 74-077A-06

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - S.S. HOLT	NASA-GSFC
OI - E.A. BOLDT	NASA-GSFC
OI - P.J. SERLEMITSOS	NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT SCANNED THE X-RAY EMISSION FROM THE ENTIRE CELESTIAL SPHERE AT ALL TIMES, THEREBY COVERING THE LARGE AREAS THAT LAY OUTSIDE THE FIELD OF VIEW OF OTHER ONBOARD EXPERIMENTS. IT WAS A VALUABLE AID IN PROGRAMMING SATELLITE MANEUVERS SO THAT TRANSIENT EVENTS IN THE X-RAY SKY, SUCH AS NEARBY NOVAE AND X-RAY FLARES, COULD BE RAPIDLY MADE AVAILABLE FOR STUDY WITH GREATER RESOLUTION BY THE OTHER EXPERIMENTS.

----- UK 5, POUNDS -----

INVESTIGATION NAME- 2- TO 10-KEV SKY SURVEY

NSSDC ID- 74-077A-02

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - K.A. POUNDS	U OF LEICESTER
OI - G.A. COOKE	U OF LEICESTER
OI - D.J. ADAMS	U OF LEICESTER
OI - R.E. GRIFFITHS	U OF LEICESTER

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A LARGE-AREA PROPORTIONAL COUNTER ARRANGED TO VIEW IN A DIRECTION PERPENDICULAR TO THE SATELLITE SPIN AXIS. THE SATELLITE ROTATION, THEREFORE, ALLOWED A SCAN OF A 360-DEG BAND OF THE SKY. WHEN THE SATELLITE SPIN AXIS WAS ARRANGED TO POINT AT A GALACTIC POLE, THE WHOLE OF THE MILKY WAY COULD BE SCANNED AT ONCE. THE EXPERIMENT COVERED THE PHOTON ENERGY RANGE 1.5 TO 20 KEV AND EFFECTED A HIGH-SENSITIVITY SURVEY, OBTAINING SOURCE LOCATIONS, INTENSITY, AND SPECTRA. A NUMBER OF DIFFERENT MODES OF OPERATION WERE USED IN WHICH THE AVAILABLE STORAGE SPACE IN THE CORE STORE OBTAINED SPATIAL INFORMATION AT THE EXPENSE OF SPECTRAL RESOLUTION OR CONVERSELY. THE SENSITIVITY OF THE EXPERIMENT ALLOWED THE DETECTION OF SOURCES OF THE ORDER OF 1.E-4 TIMES THE INTENSITY OF SCO XR-1, WITHIN THE TIME OF ABOUT 1 DAY. THE ABILITY OF THE SURVEY INSTRUMENTS TO DETERMINE THE POSITIONS OF A SOURCE DEPENDED ON THE STRENGTH OF THE SOURCE AND THE NUMBER OF OTHER SOURCES IN A GIVEN PART OF THE SKY. A SOURCE OF 5.E-3 TIMES THE STRENGTH OF SCO XR-1 COULD BE LOCATED WITH A PRECISION OF ABOUT 15 ARC MIN.

----- UK 5, POUNDS-----

INVESTIGATION NAME- POLARIMETER/SPECTROMETER

NSSDC ID- 74-077A-04

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - K.A. POUNDS	U OF LEICESTER
OI - B.A. COOKE	U OF LEICESTER
OI - D.J. ADAMS	U OF LEICESTER
OI - R.E. GRIFFITHS	U OF LEICESTER

BRIEF DESCRIPTION

THIS EXPERIMENT WAS A POLARIMETER/SPECTROMETER OPERATING IN THE 2- TO 8-KEV RANGE. IT USED TWO LARGE PLANE CRYSTALS, LITHIUM HYDRIDE AND GRAPHITE, IN A BRAGG SPECTROMETER WITH A HONEYCOMB COLLIMATOR. IT WAS MOUNTED TO VIEW ALONG THE SATELLITE SPIN AXIS AND TO EXAMINE THE RADIATION OF INDIVIDUAL X-RAY SOURCES FOR POSSIBLE POLARIZATION AND/OR THE EXISTENCE OF LINE EMISSIONS. IN A SOURCE OF THE BRIGHTNESS OF THE CRAB NEBULA, A POLARIZATION OF 2.5 PERCENT COULD BE DETECTED. THE EXPERIMENT ALSO CONDUCTED SEARCHES FOR PULSAR ACTIVITY. THE NATURE OF THE EXPERIMENT MADE IT POSSIBLE TO EXAMINE THE POLARIZATION OF THE PULSAR ITSELF BY LOOKING FOR DIFFERENT PULSAR BEHAVIOR IN THE SEPARATE POLARIZATION COMPONENTS.

\*\*\*\*\* UK 6, POUNDS\*\*\*\*\*

SPACECRAFT COMMON NAME- UK 6  
ALTERNATE NAMES- UNITED KINGDOM-6, ARIEL 6  
11382

NSSDC ID- 79-047A

LAUNCH DATE- 06/02/79 WEIGHT- 152. KG  
LAUNCH SITE- WALELOPS FLIGHT CENTER, UNITED STATES  
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY

UNITED KINGDOM	SRC
UNITED STATES	NASA-OSS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/02/79
ORBIT PERIOD- 97.3 MIN	INCLINATION- 55. DEG
PERIAPSIS- 605. KM ALT	APOAPSIS- 651. KM ALT

PERSONNEL

PM - J.E. FOSTER	APPLETON LAB
PS - J.L. CULHANE	U COLLEGE LONDON

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS MISSION WAS TO UNDERTAKE STUDIES IN HIGH-ENERGY ASTROPHYSICS. TWO X-RAY EXPERIMENTS, ONE COSMIC-RAY EXPERIMENT, AND THREE TECHNOLOGY EXPERIMENTS WERE CARRIED. THE SPACECRAFT HAS SPIN STABILIZED, WITH THE SPIN AXIS COMMENDED INTO A SEQUENCE OF ORIENTATIONS TO ACCOMMODATE THE X-RAY EXPERIMENT REQUIREMENTS.

----- UK 6, BOYD-----

INVESTIGATION NAME- X-RAY GRAZING INCIDENCE SYSTEM

NSSDC ID- 79-047A-03

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - R.L.F. BOYD	U COLLEGE LONDON
OI - A.P. WILLMORE	U OF BIRMINGHAM
OI - A.M. CRUISE	U COLLEGE LONDON
OI - C.V. GOODALL	U OF BIRMINGHAM

BRIEF DESCRIPTION

THIS SYSTEM CONSISTED OF FOUR GRAZING INCIDENCE HYPERBOLOID MIRRORS THAT REFLECTED X-RAYS THROUGH AN APERTURE/FILTER TO FOUR CONTINUOUS-FLOW PROPANE GAS DETECTORS COVERED WITH A ONE-MICROMETER POLYPROPYLENE WINDOW. THE INSTRUMENT WAS SENSITIVE TO X-RAYS FROM 0.1 TO 2 KEV AND HAD SEVEN SELECTABLE FIELDS OF VIEW FROM 0.2 TO 3.6 DEG. THE SYSTEM COULD BE OPERATED IN FOUR DIFFERENT MODES: SPECTRAL (32 CHANNELS OF PULSE HEIGHT), TIME (0.5 MS TO 16 S), PULSAR (PERIODS FROM 8 MS TO 4 H), AND AUTOCORRELATOR (PERIODIC VARIATIONS FROM 12E MS TO 2 S). THE DETECTORS POINTED ALONG THE SPACECRAFT SPIN AXIS.

----- UK 6, FOWLER-----

INVESTIGATION NAME- COSMIC RAY

NSSDC ID- 79-047A-01

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS

PERSONNEL

PI - P.H. FOWLER
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U OF BRISTOL

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF FOUR PI CERENKOV AND GAS SCINTILLATION COUNTERS WITH A GEOMETRIC FACTOR OF TWO SQ M-SR THAT WERE USED TO MEASURE THE CHARGE AND ENERGY SPECTRA OF THE ULTRAHEAVY COMPONENT OF COSMIC RADIATION WITH PARTICULAR EMPHASIS ON THE CHARGE REGION Z GREATER THAN OR EQUAL TO 30.

----- UK 6, POUNDS-----

INVESTIGATION NAME- X-RAY PROPORTIONAL COUNTERS

NSSDC ID- 79-047A-02

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

PERSONNEL

PI - K.A. POUNDS
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U OF LEICESTER

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTED OF AN ARRAY OF PROPORTIONAL COUNTERS THAT OPERATED OVER THE ENERGY RANGE 1.5 TO 30 KEV. BRIGHT X-RAY SOURCES COULD BE MEASURED TO SEVERAL MICROSECONDS TIME RESOLUTION, AND SPECTRAL DATA WERE OBTAINED IN 32 CHANNELS.

\*\*\*\*\* VELA 5A\*\*\*\*\*

SPACECRAFT COMMON NAME- VELA 5A

ALTERNATE NAMES- VELA 9 (TRW), 03954

NSSDC ID- 69-046D

LAUNCH DATE- 05/23/69 WEIGHT- 259. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY

UNITED STATES	DDD-USAF
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INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 05/24/69
ORBIT PERIOD- 6703. MIN	INCLINATION- 32.6 DEG
PERIAPSIS- 110900. KM ALT	APOAPSIS- 112210. KM ALT

PERSONNEL

PG - ARPA-STAFF	ARPA/WASH, DC
PM - SAMSO	USAF-LAS
PS - R.W. KLEBESADEL	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

VELA 5A WAS ONE OF TWO SPIN-STABILIZED, POLYHEDRAL SATELLITES THAT COMPRISED THE FIFTH LAUNCH IN THE VELA PROGRAM. THE ORBITS OF THE TWO SATELLITES ON EACH LAUNCH WERE BASICALLY CIRCULAR AT ABOUT 17 EARTH RADII, INCLINED AT 60 DEG TO THE ECLIPTIC, AND SPACED 180 DEG APART, THUS PROVIDING A MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE (1) TO STUDY SOLAR AND COSMIC X-RAYS, EUV, SOLAR PROTONS, SOLAR WIND, AND NEUTRONS, (2) TO CARRY OUT RESEARCH AND DEVELOPMENT ON METHODS OF DETECTING NUCLEAR EXPLOSIONS BY MEANS OF SATELLITE-BORNE INSTRUMENTATION, AND (3) TO PROVIDE SOLAR FLARE DATA IN SUPPORT OF MANNED SPACE MISSIONS. VELA 5A, AN IMPROVED VERSION OF THE EARLIER VELA SERIES SATELLITES, HAD BETTER COMMAND CAPABILITIES, INCREASED DATA STORAGE, IMPROVED POWER REQUIREMENTS, BETTER THERMAL CONTROL OF OPTICAL SENSORS, AND GREATER EXPERIMENTATION WEIGHT. POWER SUPPLIES OF 120 W WERE PROVIDED BY 22500 SOLAR CELLS MOUNTED ON 24 OF THE SPACECRAFT'S 26 FACES. A ROTATION RATE OF 78 RPM DURING TRANSFER ORBITS AND 1 RPM AFTER FINAL ORBIT INSERTION MAINTAINED NOMINAL ATTITUDE CONTROL. EIGHT WHIP ANTENNAS AND FOUR STUB ANTENNA ARRAYS AT OPPOSITE ENDS OF THE SPACECRAFT STRUCTURE WERE USED FOR GROUND COMMANDS AND TELEMETRY.

----- VELA 5A, BAME-----

INVESTIGATION NAME- SOLAR WIND

NSSDC ID- 69-046D-05

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

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INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.J. BAME	LOS ALAMOS SCI LAB
OI - J.R. ASBRIDGE	LOS ALAMOS SCI LAB
OI - H.E. FELTHAUSER	LOS ALAMOS SCI LAB

**BRIEF DESCRIPTION**

TWO ELECTROSTATIC ANALYZER-ELECTRON MULTIPLIER UNITS WERE USED TO STUDY THE INTERPLANETARY SOLAR WIND (INCLUDING HEAVY IONS) AND PROTONS AND ELECTRONS IN THE MAGNETOTAIL. ENERGY ANALYSIS WAS ACCOMPLISHED BY CHARGING THE PLATES TO KNOWN VOLTAGE LEVELS ALLOWING THEM TO DISCHARGE WITH KNOWN RESISTANCE CAPACITOR (RC) TIME CONSTANTS. PARTICLES IN A 6-DEG BY 100-DEG FAN-SHAPED ANGULAR RANGE WERE ACCEPTED FOR ANALYSIS DURING A DECAYING VOLTAGE CYCLE. THE 100-DEG DIMENSION WAS PARALLEL TO THE SPACECRAFT SPIN AXIS FOR BOTH DETECTORS. ONE ANALYZER-MULTIPLIER UNIT STUDIED SOLAR WIND ELECTRONS IN THE ENERGY RANGE FROM 7.5 EV TO 18.5 KEV AND SOLAR WIND POSITIVE IONS (MAINLY PROTONS AND ALPHA PARTICLES) IN AN ENERGY PER CHARGE RANGE FROM 120 V TO 5 KV. THE OTHER UNIT STUDIED MAGNETOTAIL PROTONS OR ELECTRONS BETWEEN 20 EV AND 33 KEV AND SOLAR WIND HEAVY IONS IN THE ENERGY PER CHARGE RANGE BETWEEN 1 KV AND 8.3 KV.

----- VELA 5A, BAME -----

**INVESTIGATION NAME- NEUTRON DETECTOR**

NSSDC ID- 69-0460-07

**INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION****INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS****PERSONNEL**PI - S.J. BAME  
OI - J.R. ASBRIDGELOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB**BRIEF DESCRIPTION**

THE NEUTRON DETECTOR CONSISTED OF A LARGE (ABOUT 3.6 KG) POLYETHYLENE MODERATOR SURROUNDING TWO HELIUM-3 FILLED PROPORTIONAL COUNTERS. NEUTRONS BETWEEN 1 AND 100 MEV WERE THERMALIZED BY THE MODERATOR AND DETECTED BY THE COUNTERS. THE INSTRUMENT WAS ALSO SENSITIVE TO PROTONS ABOVE 25 MEV.

----- VELA 5A, CHAMBERS -----

**INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A, 1 TO 8 A, 1 TO 16 A, 44 TO 60 A**

NSSDC ID- 69-0460-02

**INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION****INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
SCALAR PHYSICS****PERSONNEL**PI - W.H. CHAMBERS  
OI - J.C. FULLER  
OI - W.E. KUNZ  
OI - P.E. FEHLAULOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO MONITOR THE SOLAR AMBIENT AND FLARE-PRODUCED FLUX OF X RAYS IN THE 0.3- TO 60-A WAVELENGTH REGION. TWO IDENTICAL X-RAY SENSOR UNITS WERE MOUNTED AT DIAMETRICALLY OPPOSED APEX POSITIONS ON THE SATELLITE. EACH UNIT CONTAINED FOUR DETECTORS - THREE ION CHAMBERS AND A SCINTILLATION (NAI(Tl)) DETECTOR. SINCE EACH ION CHAMBER HAD A HEMISPHERICAL WINDOW, THE COMBINED OUTPUT SIGNALS FROM IDENTICAL CHAMBERS IN EACH SENSOR UNIT APPROXIMATED THE RESPONSE OF AN IDEAL DETECTOR WITH A 4-PI STERADIANT FIELD OF VIEW. THE ION CHAMBERS HAD THE FOLLOWING WINDOW MATERIALS, GAS FILLS, AND WAVELENGTH RESPONSES: CHAMBER 1 -- 0.127 MM OF BERYLLIUM, 0.9 ATM OF ARGON + 0.1 ATM OF HELIUM, 1 TO 8 A. CHAMBER 2 -- 6.35 MICROMETERS OF MYLAR OVERCOATED WITH ABOUT AN 8500-A LAYER OF ALUMINUM, 0.5 ATM OF NITROGEN, 1 TO 16 A. CHAMBER 3 -- 6.35 MICROMETERS OF MYLAR, 0.5 ATM OF NITROGEN, 1 TO 16 A AND 44 TO 60 A. THIS COMBINATION OF ION CHAMBERS ALLOWED SOLAR X-RAY FLUX MEASUREMENTS IN THE BANDS 1 TO 8 A, 1 TO 16 A, 8 TO 16 A, AND 44 TO 60 A TO BE OBTAINED UPON SUITABLE ANALYSIS OF THE DATA. THE SCINTILLATION DETECTOR USED FOR THE .3- TO 3-A WAVELENGTH REGION CONSISTED OF A THALLIUM-ACTIVATED NAI CRYSTAL OPTICALLY COUPLED TO A PMT. THE OUTPUT OF WHICH FED A FIVE-LEVEL, INTEGRAL, PULSE-HEIGHT ANALYZER. UNLIKE THE ION CHAMBERS, THE TWO SCINTILLATION DETECTORS IN THE TWO SENSOR UNITS WERE NOT IDENTICAL. THE MORE SENSITIVE DETECTOR HAD A 1.27 CM-DIAMETER, 1 MM-THICK CRYSTAL COVERED BY A FLAT 0.25 MM-THICK BERYLLIUM WINDOW. THE LESS SENSITIVE DETECTOR (1.E-9 J/(50 CM-S)) HAD A 6.35 MM-DIAMETER, 1 MM-THICK CRYSTAL AND A 2.03 MM-THICK BERYLLIUM DOME WINDOW IN ADDITION TO THE FLAT 0.25 MM WINDOW MOUNTED ON THE FACE OF THE CRYSTAL. BOTH ION CHAMBERS AND SCINTILLATION DETECTORS WERE CAPABLE OF OBSERVATIONS WITH TIME RESOLUTIONS OF 2 S. THE AVERAGE DETECTION EFFICIENCIES FOR THE ION AND SCINTILLATION DETECTORS WERE OF THE ORDER OF 20 AND 60 PERCENT, RESPECTIVELY.

----- VELA 5A, KLEBESADEL -----

**INVESTIGATION NAME- GAMMA-RAY ASTRONOMY**

NSSDC ID- 69-0460-08

**INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION****INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
GAMMA-RAY ASTRONOMY****PERSONNEL**PI - R.H. KLEBESADEL  
OI - J.B. STRONGLOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF SIX 10 CU CM CESIUM IODIDE SCINTILLATION COUNTERS DISTRIBUTED TO ACHIEVE NEARLY ISOTROPIC SENSITIVITY. INDIVIDUAL DETECTORS RESPONDED TO ENERGY DEPOSITIONS OF 0.2 TO 1.0 MEV WITH A DETECTION EFFICIENCY RANGING FROM 17 TO 50 PERCENT. THE SCINTILLATORS WERE SHIELDED AGAINST DIRECT PENETRATION BY ELECTRONS BELOW 0.75 MEV AND PROTONS BELOW 20 MEV. NO ACTIVE ANTICOINCIDENCE SHIELDING WAS PROVIDED. NORMALIZED OUTPUT PULSES FROM THE SIX DETECTORS WERE SUMMED INTO COUNTING AND LOGICS CIRCUITRY. LOGICAL SENSING OF RAPID, STATISTICALLY SIGNIFICANT COUNT RATE INCREASES INITIATED THE RECORDING OF DISCRETE COUNTS IN A SERIES OF LOGARITHMICALLY INCREASING TIME INTERVALS. THIS CAPABILITY PROVIDED CONTINUOUS TEMPORAL COVERAGE, WHICH, COUPLED WITH THE ISOTROPIC RESPONSE, IS UNIQUE IN ASTRONOMY. A TIME MEASUREMENT WAS ALSO ASSOCIATED WITH EACH RECORD. THE DATA ACCUMULATIONS INCLUDED A BACKGROUND COMPONENT DUE TO COSMIC PARTICLES AND THEIR SECONDARY EFFECTS. THE OBSERVED BACKGROUND RATE, WHICH WAS A FUNCTION OF THRESHOLD ENERGY, WAS ABOUT 150 COUNTS/S.

\*\*\*\*\* VELA 5B\*\*\*\*\*

SPACECRAFT COMMON NAME- VELA 5B  
ALTERNATE NAMES- VELA 10 (TRW), 03955  
VELA 5B (USAF)

NSSDC ID- 69-046E

LAUNCH DATE- 05/23/69  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY  
UNITED STATES  
DOD-USAF

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 6709. MIN  
PERIAPSIS- 110920. KM ALT  
EPOCH DATE- 05/25/69  
INCLINATION- 32.6 DEG  
APOAPSIS- 112283. KM ALT

**PERSONNEL**MG - ARPA-STAFF  
PM - SAMSO  
PS - R.W. KLEBESADELARPA/WASH, DC  
USAF-LAS  
LOS ALAMOS SCI LAB**BRIEF DESCRIPTION**

VELA 5B WAS ONE OF TWO SPIN-STABILIZED, POLYHEDRAL SATELLITES THAT COMPRISED THE FIFTH LAUNCH IN THE VELA PROGRAM. THE ORBITS OF THE TWO SATELLITES ON EACH LAUNCH WERE BASICALLY CIRCULAR AT ABOUT 17 EARTH RADII, INCLINED AT 60 DEG TO THE ECLIPTIC, AND SPACED 180 DEG APART, THUS PROVIDING A MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE -- (1) TO STUDY SOLAR AND COSMIC RAYS, EUV, SOLAR PROTONS, SOLAR WIND, AND NEUTRONS, (2) TO CARRY OUT RESEARCH AND DEVELOPMENT ON METHODS OF DETECTING NUCLEAR EXPLOSIONS BY MEANS OF SATELLITE-BORNE INSTRUMENTATION, AND (3) TO PROVIDE SOLAR FLARE DATA IN SUPPORT OF MANNED SPACE MISSIONS. VELA 5B, AN IMPROVED VERSION OF THE EARLIER VELA SERIES SATELLITES, HAD BETTER COMMAND CAPABILITIES, INCREASED DATA STORAGE, IMPROVED POWER REQUIREMENTS, BETTER THERMAL CONTROL OF OPTICAL SENSORS, AND GREATER EXPERIMENTATION WEIGHT. POWER SUPPLIES OF 120 W WERE PROVIDED BY 22x500 SOLAR CELLS MOUNTED ON 24 OF THE SPACECRAFT'S 26 FACES. A ROTATION RATE OF 78 RPM DURING TRANSFER ORBITS AND 1 RPM AFTER FINAL ORBIT INSERTION MAINTAINED NOMINAL ATTITUDE CONTROL. EIGHT WHIP ANTENNAS AND FOUR STUB ANTENNA ARRAYS AT OPPOSITE ENDS OF THE SPACECRAFT STRUCTURE WERE USED FOR GROUND COMMAND AND TELEMETRY.

----- VELA 5B, BAME -----

**INVESTIGATION NAME- SOLAR WIND**

NSSDC ID- 69-046E-05

**INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION****INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS****PERSONNEL**PI - S.J. BAME  
OI - J.R. ASBRIDGE  
OI - H.E. FELTHAUSERLOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB



DATA STORAGE, IMPROVED POWER REQUIREMENTS, BETTER THERMAL CONTROL OF OPTICAL SENSORS, AND GREATER EXPERIMENTATION WEIGHT. POWER SUPPLIES OF 120 W WERE PROVIDED BY 22500 SOLAR CELLS MOUNTED ON 24 OF THE SPACECRAFT'S 28 FACES. ROTATION RATES OF 78 RPM DURING TRANSFER ORBITS AND 1 RPM AFTER FINAL ORBIT INSERTION MAINTAINED NOMINAL ATTITUDE CONTROL. EIGHT WHIP ANTENNAS AND FOUR STUB ANTENNA ARRAYS AT OPPOSITE ENDS OF THE SPACECRAFT STRUCTURE WERE USED FOR GROUND COMMANDS AND TELEMETRY. THE LAUNCH OF VELA 6A AND 6B, PLUS THE TWO ACTIVE VELAS STILL IN ORBIT (VELA 5A AND 5B), COMPLETED THE OBJECTIVES OF THE VELA PROGRAM.

----- VELA 6A, BAME -----

INVESTIGATION NAME- SOLAR WIND EXPERIMENT

NSSDC ID- 70-027A-05

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.J. BAME	LOS ALAMOS SCI LAB
OI - J.R. ASBRIDGE	LOS ALAMOS SCI LAB
OI - H.E. FELTHAUSER	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

TWO ELECTROSTATIC ANALYZER-ELECTRON MULTIPLIER UNITS WERE USED TO STUDY THE INTERPLANETARY SOLAR WIND (INCLUDING HEAVY IONS) AND PROTONS AND ELECTRONS IN THE MAGNETOTAIL. ENERGY ANALYSIS WAS ACCOMPLISHED BY CHARGING THE PLATES TO KNOWN VOLTAGE LEVELS ALLOWING THEM TO DISCHARGE WITH KNOWN RESISTANCE CAPACITOR (RC) TIME CONSTANTS. PARTICLES IN A 6-DEG BY 100-DEG FAN-SHAPED ANGULAR RANGE WERE ACCEPTED FOR ANALYSIS DURING A DECAYING VOLTAGE CYCLE. THE 100-DEG DIMENSION WAS PARALLEL TO THE SPACECRAFT SPIN AXIS FOR BOTH DETECTORS. ONE ANALYZER-MULTIPLIER UNIT STUDIED SOLAR WIND ELECTRONS IN THE ENERGY RANGE FROM 7.5 EV TO 18.5 KEV AND SOLAR WIND POSITIVE IONS (MAINLY PROTONS AND ALPHA PARTICLES) IN AN ENERGY PER CHARGE RANGE FROM 120 EV/Q TO 5 KEV/Q. THE OTHER UNIT STUDIED MAGNETOTAIL PROTONS OR ELECTRONS BETWEEN 20 EV AND 33 KEV AND SOLAR WIND HEAVY IONS IN THE ENERGY PER CHARGE RANGE BETWEEN 1 KEV/Q AND 8.5 KEV/Q.

----- VELA 6A, BAME -----

INVESTIGATION NAME- NEUTRON DETECTOR

NSSDC ID- 70-027A-07

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - S.J. BAME	LOS ALAMOS SCI LAB
OI - J.R. ASBRIDGE	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE NEUTRON DETECTOR CONSISTED OF A LARGE (ABOUT 3.6 KG) POLYETHYLENE MODERATOR SURROUNDING TWO HELIUM-3 FILLED PROPORTIONAL COUNTERS. NEUTRONS BETWEEN 1 AND 100 MEV WERE THERMALIZED BY THE MODERATOR AND DETECTED BY THE COUNTERS. THE INSTRUMENT WAS ALSO SENSITIVE TO PROTONS ABOVE 25 MEV.

----- VELA 6A, CHAMBERS -----

INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A<sub>p</sub>, 1 TO 8 A<sub>p</sub>, 1 TO 16 A<sub>p</sub>, 44 TO 60 A

NSSDC ID- 70-027A-02

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
SOLAR PHYSICS

PERSONNEL

PI - W.H. CHAMBERS	LOS ALAMOS SCI LAB
OI - J.C. FULLER	LOS ALAMOS SCI LAB
OI - H.E. KUNZ	LOS ALAMOS SCI LAB
OI - P.E. FEHLAU	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THIS EXPERIMENT WAS DESIGNED TO MONITOR THE SOLAR AMBIENT AND FLARE-PRODUCED FLUX OF X RAYS IN THE 0.5- TO 60-A WAVELENGTH REGION. TWO IDENTICAL X-RAY SENSOR UNITS WERE MOUNTED AT DIAMETRICALLY OPPOSED APEX POSITIONS ON THE SATELLITE. EACH UNIT CONTAINED FOUR DETECTORS -- THREE ION CHAMBERS AND A SCINTILLATION (NAIC(1)) DETECTOR. AS EACH ION CHAMBER HAD A HEMISPHERICAL WINDOW, THE COMBINED OUTPUT SIGNALS FROM IDENTICAL CHAMBERS IN EACH SENSOR UNIT APPROXIMATED THE RESPONSE OF AN IDEAL DETECTOR WITH A 4-PI STERADIAN FIELD OF VIEW. THE ION CHAMBERS HAD THE FOLLOWING WINDOW MATERIALS, GAS FILLS, AND WAVELENGTH RESPONSES. CHAMBER 1 -- 0.127 MM OF BERYLLIUM, 0.9 ATM OF ARGON + 0.1 ATM OF HELIUM, 1 TO 8 A<sub>p</sub>. CHAMBER 2 -- 6.35 MICRUMETER OF MYLAR OVERCOATED WITH ABOUT AN 8500 A LAYER OF ALUMINUM; 0.5 ATM OF NITROGEN; 1 TO 16 A<sub>p</sub>. CHAMBER 3 -- 6.35 MICRUMETER OF MYLAR, 0.5 ATM OF NITROGEN, 1 TO 16 A<sub>p</sub> AND 44 TO 60 A<sub>p</sub>. THIS COMBINATION OF ION CHAMBERS ALLOWED SOLAR X-RAY FLUX MEASUREMENTS IN THE BANDS 1 TO 8 A<sub>p</sub>, 1

TO 16 A<sub>p</sub>, 8 TO 16 A<sub>p</sub>, AND 44 TO 60 A<sub>p</sub> TO BE OBTAINED UPON SUITABLE ANALYSIS OF THE DATA. THE SCINTILLATION DETECTOR USED FOR THE 0.5- TO 3-A WAVELENGTH REGION CONSISTED OF A THALLIUM-ACTIVATED NAI CRYSTAL OPTICALLY COUPLED TO A PRT, THE OUTPUT OF WHICH FED A FIVE-LEVEL, INTEGRAL, PULSE-HEIGHT ANALYZER. UNLIKE THE ION CHAMBERS, THE TWO SCINTILLATION DETECTORS IN THE TWO SENSOR UNITS WERE NOT IDENTICAL. THE MORE SENSITIVE DETECTOR HAD A 1.27 CM-DIAMETER, 1 MM-THICK CRYSTAL COVERED BY A FLAT 0.25 MM-THICK BERYLLIUM WINDOW. THE LESS SENSITIVE DETECTOR (1.E-9 J/50 CM-S) HAD A 0.38 MM-DIAMETER, 1 MM-THICK CRYSTAL AND A 2.03 MM-THICK BERYLLIUM BORE WINDOW IN ADDITION TO THE FLAT 0.25 MM WINDOW MOUNTED ON THE FACE OF THE CRYSTAL. BOTH ION CHAMBERS AND SCINTILLATION DETECTORS WERE CAPABLE OF OBSERVATIONS WITH TIME RESOLUTIONS OF 2 S. THE AVERAGE DETECTION EFFICIENCIES FOR THE ION AND SCINTILLATION DETECTORS WERE OF THE ORDER OF 20 AND 60 PERCENT, RESPECTIVELY.

----- VELA 6A, HIGBIE -----

INVESTIGATION NAME- SOLAR PARTICLE TELESCOPES

NSSDC ID- 70-027A-03

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - P.R. HIGBIE	LOS ALAMOS SCI LAB
OI - R.D. DELIAN	LOS ALAMOS SCI LAB
OI - D.N. BAKER	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE SOLAR TELESCOPE EXPERIMENT WAS DESIGNED TO MEASURE THE ENERGY SPECTRUM AND ANGULAR DISTRIBUTION OF SOLAR PROTONS BETWEEN 0.5 AND 50 MEV AND OF SOLAR ALPHA PARTICLES BETWEEN 2 AND 100 MEV. IN ADDITION, THE EXPERIMENT WAS DESIGNED TO IDENTIFY AND MONITOR THE FLUX OF DEUTERIUM, TRITIUM, AND HELIUM-3 NUCLEI WHICH MAY BE EMITTED DURING A SOLAR PARTICLE FLARE AND TO MONITOR THE INTENSITY OF MORE HEAVILY IONIZED PARTICLES. THERE WERE THREE TELESCOPES IN A SINGLE PLANE, ORIENTED AT ANGLES OF 45 DEG, 90 DEG, AND 135 DEG RELATIVE TO THE SPACECRAFT SPIN AXIS. EACH INSTRUMENT CONSISTED OF A COLLIMATING TUBE (PROVIDING AN ANGULAR VIEW OF 30 DEG) IN FRONT OF A SOLID-STATE DE/DX VS E PARTICLE DETECTOR.

----- VELA 6A, HIGBIE -----

INVESTIGATION NAME- ELECTRON DETECTORS

NSSDC ID- 70-027A-04

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R. HIGBIE	LOS ALAMOS SCI LAB
OI - R.D. DELIAN	LOS ALAMOS SCI LAB
OI - D.N. BAKER	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

TWO SETS OF THREE SOLID-STATE ELECTRON DETECTORS IN A TELESCOPIC ARRANGEMENT WITH AN ANGULAR VIEW OF 30 DEG WERE USED TO OBSERVE ELECTRONS OVER THE RANGE 30 TO 150 KEV. PROTONS OF ENERGY LESS THAN 300 KEV AND GREATER THAN 50 KEV COULD ALSO BE DETECTED. ONE SET OF DETECTORS VIEWED THE PARTICLES DIRECTLY. THE OTHER UTILIZED A SCATTER GEOMETRY TO IMPROVE ITS ABILITY TO OBSERVE ELECTRONS IN THE PRESENCE OF MUCH LARGER FLUXES OF PROTONS. EACH OF THE THREE DIRECT-VIEW DETECTORS AND EACH OF THE THREE SCATTER GEOMETRY DETECTORS LAY IN A SINGLE PLANE AND MADE ANGLES OF 45 DEG, 90 DEG, AND 135 DEG WITH THE SPACECRAFT SPIN AXIS.

----- VELA 6A, KLEBESADEL -----

INVESTIGATION NAME- GAMMA-RAY ASTRONOMY

NSSDC ID- 70-027A-08

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - R.W. KLEBESADEL	LOS ALAMOS SCI LAB
OI - I.P. STRONG	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF SIX 10 CU CM CESIUM IODIDE SCINTILLATION COUNTERS DISTRIBUTED TO ACHIEVE NEARLY ISOTROPIC SENSITIVITY. INDIVIDUAL DETECTORS RESPONDED TO ENERGY DEPOSITIONS OF 0.5 TO 1.5 MEV WITH A DETECTION EFFICIENCY RANGING FROM 17 TO 50 PERCENT. THE SCINTILLATORS WERE SHIELDED AGAINST DIRECT PENETRATION BY ELECTRONS BELOW 0.75 MEV AND PROTONS BELOW 20 MEV. NO ACTIVE ANTCOINCIDENCE SHIELDING WAS PROVIDED. NORMALIZED OUTPUT PULSES FROM THE SIX DETECTORS WERE SUMMED INTO COUNTING AND LOGICS CIRCUITRY. LOGICAL SENSING OF RAPID, STATISTICALLY SIGNIFICANT COUNT RATE INCREASES INITIATED THE RECORDING OF DISCRETE COUNTS IN A SERIES OF LOGARITHMICALLY INCREASING TIME INTERVALS. THIS CAPABILITY PROVIDED CONTINUOUS

ORIGINAL PAGE  
OF FAIR QUALITY

TEMPORAL COVERAGE WHICH, COUPLED WITH THE ISOTROPIC RESPONSE, WAS UNIQUE IN ASTRONOMY. A TIME MEASUREMENT WAS ALSO ASSOCIATED WITH EACH RECORD. THE DATA ACCUMULATIONS INCLUDED A BACKGROUND COMPONENT, DUE TO COSMIC PARTICLES AND THEIR SECONDARY EFFECTS. THE OBSERVED BACKGROUND RATE, WHICH WAS A FUNCTION OF THRESHOLD ENERGY, WAS ABOUT 20 COUNTS/S.

\*\*\*\*\* VELA 6B \*\*\*\*\*

SPACERCAFT COMMON NAME- VELA 6B  
ALTERNATE NAMES- PL-702C, VELA 12 (TRW)  
04368, VELA 6B (USAFA)

NSSDC ID- 70-0278

LAUNCH DATE- 04/08/70 WEIGHT- 261. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOB- USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 6745. MIN  
PERIAPSIS- 111500. KM ALT

EPOCH DATE- 04/11/70  
INCLINATION- 32.52 DEG  
APOAPSIS- 112210. KM ALT

PERSONNEL

MG - ARPA-STAFF  
PM - SANSO  
PS - R.W. KLEBESADEL

ARPA/WASH, DC  
USAF-LAS  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

VELA 6B WAS ONE OF TWO SPIN-STABILIZED, POLYHEDRAL SATELLITES THAT COMPRISED THE SIXTH LAUNCH IN THE VELA PROGRAM. THE ORBITS OF THE TWO SATELLITES ON EACH LAUNCH WERE BASICALLY CIRCULAR AT ABOUT 17 EARTH RADII, INCLINED AT 60 DEG TO THE ECLIPTIC, AND SPACED 180 DEG APART, THUS PROVIDING A MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE (1) TO STUDY SOLAR AND COSMIC X-RAYS, UV-VIS SOLAR PROTONS, SOLAR WIND, AND NEUTRONS; (2) TO CARRY OUT RESEARCH AND DEVELOPMENT ON METHODS OF DETECTING NUCLEAR EXPLOSIONS BY MEANS OF SATELLITE-BORNE INSTRUMENTATION, AND (3) TO PROVIDE SOLAR FLARE DATA IN SUPPORT OF MANNED SPACE MISSIONS. VELA 6B WAS AN IMPROVED VERSION OF THE EARLIER VELA SERIES SATELLITES HAVING BETTER COMMAND CAPABILITIES, INCREASED DATA STORAGE, IMPROVED POWER REQUIREMENTS, BETTER THERMAL CONTROL OF OPTICAL SENSORS, AND GREATER EXPERIMENTATION WEIGHT. POWER SUPPLIES OF 120 W WERE PROVIDED BY 22,500 SOLAR CELLS MOUNTED ON 24 OF THE SPACECRAFT'S 26 FACES. A ROTATION RATE OF 78 RPM DURING TRANSFER ORBITS AND 1 RPM AFTER FINAL ORBIT INSERTION MAINTAINED NOMINAL ATTITUDE CONTROL. EIGHT WHIP ANTENNAS AND FOUR STUB ANTENNA ARRAYS AT OPPOSITE ENDS OF THE SPACECRAFT STRUCTURE WERE USED FOR GROUND COMMANDS AND TELEMETRY. THE LAUNCH OF VELA 6A AND 6B, PLUS THE TWO ACTIVE VELAS STILL IN ORBIT (VELA 5A AND B), COMPLETED THE OBJECTIVES OF THE VELA PROGRAM.

\*\*\*\*\* VELA 6B, BAME\*\*\*\*\*

INVESTIGATION NAME- NEUTRON DETECTOR

NSSDC ID- 70-0278-07

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL

PI - S.J. BAME  
OI - J.R. ASBRIDGE

LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE NEUTRON DETECTOR CONSISTED OF A LARGE (ABOUT 3.6 KG) POLYETHYLENE MODERATOR SURROUNDING TWO HELIUM-3 FILLED PROPORTIONAL COUNTERS. NEUTRONS BETWEEN 1 AND 100 MEV WERE THERMALIZED BY THE MODERATOR AND DETECTED BY THE COUNTERS. THE INSTRUMENT WAS ALSO SENSITIVE TO PROTONS ABOVE 25 MEV.

\*\*\*\*\* VELA 6B, HIGBIE\*\*\*\*\*

INVESTIGATION NAME- SOLAR PARTICLE TELESCOPES

NSSDC ID- 70-0278-03

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
SCALAR PHYSICS

PERSONNEL

PI - P.R. HIGBIE  
OI - R.D. BELIAN  
OI - D.N. BAKER

LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE SOLAR TELESCOPE EXPERIMENT WAS DESIGNED TO MEASURE THE ENERGY SPECTRUM AND ANGULAR DISTRIBUTION OF SOLAR PROTONS BETWEEN 0.5 AND 50 MEV AND OF SOLAR ALPHA PARTICLES BETWEEN 2 AND 100 MEV. IN ADDITION, THE EXPERIMENT WAS DESIGNED TO IDENTIFY AND MONITOR THE FLUX OF DEUTERIUM, TRITIUM, AND HELIUM-3 NUCLEI WHICH MAY BE EMITTED DURING A SOLAR PARTICLE FLARE AND TO MONITOR THE INTENSITY OF MORE HEAVILY IONIZED

PARTICLES. THERE WERE THREE TELESCOPES IN A SINGLE PLANE, ORIENTED AT ANGLES OF 45 DEG, 90 DEG, AND 135 DEG RELATIVE TO THE SPACECRAFT SPIN AXIS. EACH INSTRUMENT CONSISTED OF A COLLIMATING TUBE (PROVIDING AN ANGULAR VIEW OF 30 DEG) IN FRONT OF A SOLID-STATE BE/DK VS E PARTICLE DETECTOR.

\*\*\*\*\* VELA 6B, HIGBIE\*\*\*\*\*

INVESTIGATION NAME- ELECTRON DETECTORS

NSSDC ID- 70-0278-04

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R. HIGBIE  
OI - R.D. BELIAN  
OI - D.N. BAKER

LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

TWO SETS OF THREE SOLID-STATE ELECTRON DETECTORS IN A TELESCOPIC ARRANGEMENT WITH AN ANGULAR VIEW OF 30 DEG WERE USED TO OBSERVE ELECTRONS OVER THE RANGE 30 TO 150 KEV. PROTONS OF ENERGY LESS THAN 300 KEV AND GREATER THAN 50 MEV COULD ALSO BE DETECTED. ONE SET OF DETECTORS VIEWED THE PARTICLES DIRECTLY. THE OTHER UTILIZED A SCATTER GEOMETRY TO IMPROVE ITS ABILITY TO OBSERVE ELECTRONS IN THE PRESENCE OF MUCH LARGER FLUXES OF PROTONS. EACH OF THE THREE DIRECT-VIEW DETECTORS AND EACH OF THE THREE SCATTER METRY DETECTORS LAY IN A SINGLE PLANE AND SPAN ANGLES OF 45 DEG, 90 DEG, AND 135 DEG WITH THE SPACECRAFT SPIN AXIS.

\*\*\*\*\* VELA 6B, KLEBESADEL\*\*\*\*\*

INVESTIGATION NAME- GAMMA-RAY ASTRONOMY

NSSDC ID- 70-0278-06

INVESTIGATIVE PROGRAM  
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - R.W. KLEBESADEL  
OI - L.B. STRONG  
OI - R.A. OLSON

LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF SIX 10 CM CDS Cesium Iodide SCINTILLATION COUNTERS DISTRIBUTED TO ACHIEVE NEARLY ISOTROPIC SENSITIVITY. INDIVIDUAL DETECTORS RESPONDED TO ENERGY DEPOSITIONS OF 0.3 TO 1.5 MEV WITH A DETECTION EFFICIENCY RANGING FROM 17 TO 50 PERCENT. THE SCINTILLATORS WERE SHIELDED AGAINST DIRECT PENETRATION BY ELECTRONS BELOW 0.75 MEV AND PROTONS BELOW 20 MEV. NO ACTIVE ANTICOINCIDENCE SHIELDING WAS PROVIDED. NORMALIZED OUTPUT PULSES FROM THE SIX DETECTORS WERE SUMMED INTO COUNTING AND LOGICS CIRCUITRY. LOGICAL SENSING OF RAPID, STATISTICALLY SIGNIFICANT COUNT RATE INCREASES INITIATED THE RECORDING OF DISCRETE COUNTS IN A SERIES OF LOGARITHMICALLY INCREASING TIME INTERVALS. THIS CAPABILITY PROVIDED CONTINUOUS TEMPORAL COVERAGE WHICH, COUPLED WITH THE ISOTROPIC RESPONSE, WAS UNIQUE IN ASTRONOMY. A TIME MEASUREMENT WAS ALSO ASSOCIATED WITH EACH RECORD. THE DATA ACCUMULATIONS INCLUDED A BACKGROUND COMPONENT, DUE TO COSMIC PARTICLES AND THEIR SECONDARY EFFECTS. THE OBSERVED BACKGROUND RATE, WHICH WAS A FUNCTION OF THRESHOLD ENERGY, WAS ABOUT 20 COUNTS/S.

\*\*\*\*\* VENERA 11\*\*\*\*\*

SPACERCAFT COMMON NAME- VENERA 11

ALTERNATE NAMES- 11020

NSSDC ID- 78-084A

LAUNCH DATE- 09/09/76 WEIGHT- KG  
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.  
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY  
U.S.S.R. SAS

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- DAYS  
PERIAPSIS- AU RAD

EPOCH DATE-  
INCLINATION-  
APOAPSIS- DEG  
AU RAD

PERSONNEL

PM - UNKNOWN  
PS - O.L. VAISBERG

IKI  
IKI

BRIEF DESCRIPTION

VENERA 11 WAS PART OF A TWO SPACECRAFT MISSION TO STUDY VENUS AND THE INTERSOLAR MEDIUM. EACH OF THE TWO SPACECRAFT, VENERA 11 AND VENERA 12, CONSISTED OF A FLIGHT PLATFORM AND A LANDER PROBE. IDENTICAL INSTRUMENTS WERE CARRIED ON THE SPACECRAFT. THE FLIGHT PLATFORM HAD INSTRUMENTS TO STUDY SOLAR WIND COMPOSITION, GAMMA RAY BURSTS, ULTRAVIOLET RADIATION, AND THE ELECTRON COMPOSITION OF THE IONOSPHERE OF VENUS. THE LANDER PROBE CARRIED INSTRUMENTS TO STUDY THE CHARACTERISTICS AND COMPOSITION OF THE ATMOSPHERE OF VENUS. AFTER EJECTION OF

THE LANDER PROBE THE FLIGHT PLATFORM CONTINUED IN A HELIOCENTRIC ORBIT. NEAR ENCOUNTER WITH VENUS OCCURRED ON DECEMBER 29, 1979 AT APPROXIMATELY 34,000 KM ALTITUDE.

----- VENERA 11: ESTULIN -----

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER

NSSDC ID- 78-084A-01

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - I.V. ESTULIN  
PI - G. VEDRENNE

IKI  
CESR

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE SOLAR AND COSMIC GAMMA-RAY BURSTS, TO ACCURATELY MEASURE THEIR POSITION IN CONJUNCTION WITH MEASUREMENTS FROM OTHER SPACECRAFT, AND TO DETERMINE THE ENERGY SPECTRA AND TEMPORAL CHARACTERISTICS OF THE BURSTS. THE INSTRUMENTATION CONSISTED OF TWO SCINTILLATION DETECTORS. ONE WAS POINTED TOWARDS THE SUN, THE OTHER WAS AT 180 DEG FROM THE FIRST. THE DETECTORS MEASURED 0.00 TO 2.5 KEV IN 7 CHANNELS. THE DETECTORS HAD A SENSITIVITY OF  $5.0 \times 10^{-6}$  ERGS/SR CM FOR EACH GAMMA-RAY BURST DETECTED.

----- VENERA 11: GRINGAUZ -----

INVESTIGATION NAME- RETARDING POTENTIAL TRAPS

NSSDC ID- 78-084A-02

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - K.I. GRINGAUZ

IKI

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO STUDY THE ENERGY SPECTRA OF THE ION AND ELECTRON COMPONENTS OF THE SOLAR WIND AT VARYING DISTANCES FROM THE SUN. THE INSTRUMENT WAS A RETARDING POTENTIAL ANALYZER WHICH MEASURED IONS FROM 0 TO 4.5 KEV AND ELECTRONS FROM 0 TO 200 EV. THE DETECTOR HAD A SENSITIVITY OF  $3.0 \times 10^{-5}$  TO  $3.0 \times 10^{-9}$  SR CM/S. IT WAS OPERATED AT INTERVALS DURING THE MISSION.

----- VENERA 11: KURT -----

INVESTIGATION NAME- UV GRATING MONOCHROMATOR

NSSDC ID- 78-084A-03

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - V.G. KURT  
PI - J.L. BERTAUX

IKI  
CNRS-SI

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE SCATTERED UV RADIATION FROM INTERPLANETARY SPACE AND VENUS BY ANALYZING SPECTRAL LINES AT 504, 589, 736, 869, 1048, 1216, 1300, 1356, AND 1500 Å. DETERMINATIONS OF LINE SPECTRA FOR H, HE I, HE II, O I, O II, NE I, AR I, AND CO WERE MADE WHEN THE SPACECRAFT WAS CLOSE TO VENUS. LINE INTENSITY FOR H, HE I, AND HE II WERE DETERMINED WHILE THE SPACECRAFT WAS IN INTERPLANETARY SPACE. THE DETECTOR CONSISTED OF A MULTICHANNEL GRATING MONOCHROMATOR WITH THE OPTICAL AXIS ORIENTED IN THE ANTI-SOLAR DIRECTION. THIS INVESTIGATION WAS OPERATED AT SELECTED INTERVALS DURING THE MISSION INCLUDING A SCAN OF THE SOLAR ILLUMINATED VENUS' DISK.

----- VENERA 11: LOGACHEV -----

INVESTIGATION NAME- ELECTRON AND PROTON SPECTROMETER

NSSDC ID- 78-084A-04

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - Yu.I. LOGACHEV

\* NUCLEAR PHYSICS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE THE SPECTRA AND ANGULAR DISTRIBUTION OF ELECTRONS AND PROTONS IN THE SOLAR WIND. IT USED PROPORTIONAL COUNTERS, GEIGER COUNTERS, AND SEMICONDUCTOR AND SCINTILLATION DETECTORS. ELECTRONS FROM 5 TO 500 KEV AND PROTONS IN TWO RANGES - 0.05 TO 1 MEV AND 30 TO 200 MEV WERE MEASURED. THE INSTRUMENTATION HAD A SENSITIVITY UP TO  $5.0 \times 10^{-6}$  ERGS/SR CM/S/SR.

----- VENERA 11: MAZETS -----

INVESTIGATION NAME- GAMMA-RAY BURST DETECTORS

NSSDC ID- 78-084A-05

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - E.P. MAZETS

LENINRAD INST PHYS TECH

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO DETERMINE THE COORDINATES OF GAMMA-RAY BURSTS TO WITHIN 2-3 DEG. THE INSTRUMENTATION CONSISTED OF SIX IDENTICAL SCINTILLATION DETECTORS WITH THEIR ORIENTATION ALONG THE GEOMETRIC AXIS OF THE SPACECRAFT. THEY HAD A MEASUREMENT RANGE OF 20 TO 300 KEV WITH A SENSITIVITY OF  $1.0 \times 10^{-6}$  ERGS/SR CM.

----- VENERA 11: PISARENKO -----

INVESTIGATION NAME- PROTON SPECTROMETER

NSSDC ID- 78-084A-06

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - N.F. PISARENKO

IKI

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO STUDY PROTON ACCELERATION IN THE INTERPLANETARY MEDIUM AND THE SOLAR ACTIVITY PROCESSES INVOLVED IN THE ORIGIN OF CHARGED PARTICLES. THE INSTRUMENTATION CONSISTED OF A SEMICONDUCTOR SPECTROMETER WITH AN Si N-DETECTOR. IT HAD 10 CHANNELS COVERING FROM 0.3 TO 100 MEV AND WAS SENSITIVE TO A FLUX OF  $1.0 \times 10^{-4}$  PROTONS/SR CM/S AT 10 MEV.

----- VENERA 11: SAVICH -----

INVESTIGATION NAME- TWO-FREQUENCY TRANSMITTERS

NSSDC ID- 78-084A-07

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - N.A. SAVICH

IRE

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO STUDY THE ELECTRON CONCENTRATION DISTRIBUTION IN THE IONOSPHERE OF VENUS AND TO STUDY FLUCTUATION OF ELECTRON CONCENTRATION IN INTERPLANETARY AND NEAR-SUN PLASMAS. THIS INVESTIGATION USED RADIO TRANSMISSIONS IN THE CENTIMETER AND DECIMETER RANGE.

----- VENERA 11: VAISBERG -----

INVESTIGATION NAME- SOLAR WIND PLASMA DETECTORS

NSSDC ID- 78-084A-08

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - O.L. VAISBERG

IKI

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO MEASURE THE ENERGY SPECTRA OF THE SOLAR WIND ION AND ELECTRON COMPONENTS. IT ALSO MEASURED SEPARATELY PROTONS AND ALPHA PARTICLES AT VARYING DISTANCES FROM THE SUN. THE INVESTIGATION USED ELECTROSTATIC ANALYZERS, AND A FARADAY CYLINDER. ELECTRONS WERE MEASURED FROM 10 TO 200 EV IN 24 STEPS, TOTAL ION CONCENTRATIONS FROM 0.25 TO 5 KEV IN 24 STEPS, PROTONS FROM 0.25 TO 5 KEV IN 24 STEPS, AND ALPHA PARTICLES FROM 0.5 TO 10 KEV IN 24 STEPS. SPECTRAL MEASUREMENTS TOOK 192 S. THE FLUX SENSITIVITY WAS  $5.0 \times 10^{-7}$  TO  $1.0 \times 10^{-10}$  SR CM/S. THE INSTRUMENT WAS OPERATED AT INTERVALS DURING THE FLIGHT PATH.

\*\*\*\*\* VENERA 12 \*\*\*\*\*

SPACECRAFT COMMON NAME- VENERA 12  
ALTERNATE NAMES- 11026

NSSDC ID- 78-086A

LAUNCH DATE- 09/14/78 WEIGHT- KG  
LAUNCH SITE- TYURATAN (BAIKONUR COSMODROME), U.S.S.R.  
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY  
U.S.S.R.

SAS

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- DAYS  
PERIAPSIS- AU RAD

EPOCH DATE-  
INCLINATION- DEG  
APOAPSIS- AU RAD

PERSONNEL

PI - UNKNOWN  
PB - O.L. VAISBERG

SOVIET ACADEMY OF SCI

BRIEF DESCRIPTION

VENERA 12 WAS PART OF A TWO SPACECRAFT MISSION TO STUDY VENUS AND THE INTERSOLAR MEDIUM. EACH OF THE TWO SPACECRAFT, VENERA 11 AND VENERA 12, CONSISTED OF A FLIGHT PLATFORM AND A LANDER PROBE. IDENTICAL INSTRUMENTS WERE CARRIED ON THE SPACECRAFT. THE FLIGHT PLATFORM HAD INSTRUMENTS TO STUDY SOLAR WIND COMPOSITION, GAMMA-RAY BURSTS, ULTRAVIOLET RADIATION, AND THE ELECTRON COMPOSITION OF THE IONOSPHERE OF VENUS. THE LANDER PROBE CARRIED INSTRUMENTS TO STUDY THE CHARACTERISTICS AND COMPOSITION OF THE ATMOSPHERE OF VENUS. AFTER EJECTION OF THE LANDER PROBE, THE FLIGHT PLATFORM CONTINUED IN A HELIOCENTRIC ORBIT. NEAR ENCOUNTER WITH VENUS OCCURRED ON DECEMBER 23, 1978 AT APPROXIMATELY 34,000 KM ALTITUDE.

----- VENERA 12, ESTULIN -----

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER

NSSDC ID- 78-086A-01

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - I.V. ESTULIN  
PB - G. VEDRENNE

IKI  
CESR

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE SOLAR AND COSMIC GAMMA-RAY BURSTS, TO ACCURATELY MEASURE THEIR POSITION IN CONJUNCTION WITH MEASUREMENTS FROM OTHER SPACECRAFT, AND TO DETERMINE THE ENERGY SPECTRA AND TEMPORAL CHARACTERISTICS OF THE BURSTS. THE INSTRUMENTATION CONSISTED OF TWO SCINTILLATION DETECTORS. ONE WAS POINTED TOWARDS THE SUN, THE OTHER WAS AT 120 DEG FROM THE FIRST. THE DETECTORS MEASURED 0.08 TO 2.5 KEV IN 7 CHANNELS. THE DETECTORS HAD A SENSITIVITY OF 5.0E-6 ERGS/50 CM FOR EACH GAMMA-RAY BURST DETECTED.

----- VENERA 12, GRINGAUZ -----

INVESTIGATION NAME- RETARDING POTENTIAL TRAPS

NSSDC ID- 78-086A-02

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - K.I. GRINGAUZ

IKI

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO STUDY THE ENERGY SPECTRA OF THE ION AND ELECTRON COMPONENTS OF THE SOLAR WIND AT VARYING DISTANCES FROM THE SUN. THE INSTRUMENT WAS A RETARDING POTENTIAL ANALYZER WHICH MEASURED IONS FROM 0 TO 4.5 KEV AND ELECTRONS FROM 0 TO 300 EV. THE DETECTOR HAD A SENSITIVITY OF 3.0E+5 TO 3.0E+9/50 CM/S. IT WAS OPERATED AT INTERVALS DURING THE MISSION.

----- VENERA 12, KURT -----

INVESTIGATION NAME- UV GRATING MONOCHROMATOR

NSSDC ID- 78-086A-03

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - V.G. KURT  
PB - J.L. BERTAUD

IKI  
CNRS-SA

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE SCATTERED UV RADIATION FROM INTERPLANETARY SPACE AND VENUS BY ANALYZING SPECTRAL LINES AT 304, 584, 731, 869, 1048, 1216, 1300, 1356, AND 1500 Å. DETERMINATIONS OF LINE SPECTRA FOR H, HE I, HE II, O I, NE I, AR I, AND CO WERE MADE WHEN THE SPACECRAFT WAS CLOSE TO VENUS. LINE INTENSITY FOR H, HE I, AND HE II WERE DETERMINED WHILE THE SPACECRAFT WAS IN INTERPLANETARY SPACE. THE DETECTOR CONSISTED OF A MULTICHANNEL

GRATING MONOCHROMATOR WITH THE OPTICAL AXIS ORIENTED IN THE ANTI-SOLAR DIRECTION. THIS INVESTIGATION WAS OPERATED AT SELECTED INTERVALS DURING THE MISSION INCLUDING A SCAN OF THE SOLAR ILLUMINATED VENUS' DISK.

----- VENERA 12, LOGACHEV -----

INVESTIGATION NAME- ELECTRON AND PROTON SPECTROMETER

NSSDC ID- 78-086A-04

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - V.L. LOGACHEV

INST NUCLEAR PHYSICS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO MEASURE THE SPECTRA AND ANGULAR DISTRIBUTION OF ELECTRONS AND PROTONS IN THE SOLAR WIND. IT USED PROPORTIONAL COUNTERS, GEIGER COUNTERS, AND SEMICONDUCTOR AND SCINTILLATION DETECTORS. ELECTRONS FROM 5 TO 500 KEV AND PROTONS IN TWO RANGES - 0.05 TO 1 KEV AND 30 TO 200 KEV WERE MEASURED. THE INSTRUMENTATION HAD A SENSITIVITY UP TO 5.0E+5/50 CM/S/DEG.

----- VENERA 12, MAZETS -----

INVESTIGATION NAME- GAMMA-RAY BURST DETECTORS

NSSDC ID- 78-086A-05

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - E.P. MAZETS

LENGRAD INST PHYS TECH

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION WAS TO DETERMINE THE COORDINATES OF GAMMA-RAY BURSTS TO WITHIN 2-3 DEG. THE INSTRUMENTATION CONSISTED OF SIX IDENTICAL SCINTILLATION DETECTORS WITH THEIR ORIENTATION ALONG THE GEOMETRIC AXIS OF THE SPACECRAFT. THEY HAD A MEASUREMENT RANGE OF 20 TO 300 KEV WITH A SENSITIVITY OF 1.0E-6 ERGS/50 CM.

----- VENERA 12, PISARENKO -----

INVESTIGATION NAME- PROTON SPECTROMETER

NSSDC ID- 78-086A-06

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - N.F. PISARENKO

IKI

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO STUDY PROTON ACCELERATION IN THE INTERPLANETARY MEDIUM AND THE SOLAR ACTIVITY PROCESSES INVOLVED IN THE ORIGIN OF CHARGED PARTICLES. THE INSTRUMENTATION CONSISTED OF A SEMICONDUCTOR SPECTROMETER WITH AN Si(Li) DETECTOR. IT HAD 10 CHANNELS COVERING FROM 0.1 TO 100 KEV AND WAS SENSITIVE TO A FLUX OF 1.0E+4 PROTONS/50 CM/S AT 10 KEV.

----- VENERA 12, SAVICH -----

INVESTIGATION NAME- PROTON SPECTROMETER

NSSDC ID- 78-086A-07

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
IONIC RES AND RADIO PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - N.A. SAVICH

IRF

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION WERE TO STUDY THE ELECTRON CONCENTRATION DISTRIBUTION IN THE IONOSPHERE OF VENUS AND TO STUDY FLUCTUATION OF ELECTRON CONCENTRATION IN INTERPLANETARY AND NEAR-SUN PLASMAS. THIS INVESTIGATION USED RADIO TRANSMISSIONS IN THE CENTIMETER AND DECIMETER RANGE.

----- VENERA 12, VAISBERG -----

INVESTIGATION NAME- SOLAR WIND PLASMA DETECTORS

NSSDC ID- 78-086A-08

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS



ORBIT PARAMETERS  
ORBIT TYPE- AREOCENTRIC  
ORBIT PERIOD- 1479. MIN  
PERIAPSIS- 1913. KM ALT

EPOCH DATE- 06/21/76  
INCLINATION- 37.9 DEG  
APOAPSIS- 32680. KM ALT

PERSONNEL

MG - U. JAKOBOWSKI  
SC - R.S. YOUNG  
PM - K.S. WATKINS  
PB - C.W. SNYDER

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-JPL  
NASA-JPL

BRIEF DESCRIPTION

THE VIKING SPACECRAFT CONSISTED OF AN ORBITER AND A LANDER. THE LANDER SEPARATED FROM THE ORBITER, ENTERED THE MARTIAN ATMOSPHERE, AND SOFT-LANDED JULY 20, 1976. SCIENTIFIC DATA WERE COLLECTED AND TRANSMITTED TO EARTH FROM THE LANDER DURING ENTRY AND WHILE IT WAS ON THE SURFACE, AND FROM THE ORBITER BEFORE AND AFTER LANDER SEPARATION. THE ORBITER WAS A SOLAR-CELL-POWERED SATELLITE STABILIZED IN THREE AXES USING INERTIAL AND CELESTIAL REFERENCES. THERE WAS A 500-W POWER CAPACITY FOR THE ORBITER. IT CARRIED INSTRUMENTS FOR CONDUCTING IMAGING, ATMOSPHERIC WATER VAPOR, THERMAL MAPPING, AND RADIO SCIENCE INVESTIGATIONS. THE SCIENTIFIC AND PHOTOGRAPHIC ANALYSIS INSTRUMENTS HAD A MASS OF APPROXIMATELY 72 KG (158 LB). THE ORBITER HAS AN OCTAGON APPROXIMATELY 2.5 M ACROSS. THE EIGHT SIDES OF THE RING-LIKE STRUCTURE WERE .457 M HIGH AND WERE ALTERNATELY 1.4 AND 0.6 WIDE.

----- VIKING 1 ORBITER, KIEFFER -----

INVESTIGATION NAME- ORBITER IMAGING

NSSDC ID- 75-075A-01

INVESTIGATIVE PROGRAM

CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

TL - M.H. CARR  
TM - W.A. BAUM  
TM - H. MASURSKY  
TM - G.A. BRIGGS  
TM - J.A. CUTTS  
TM - T.C. DUXBURY  
TM - K.R. BLASIUS  
TM - R. GREELEY  
TM - J.E. GUEST  
TM - K.A. HOWARD  
TM - D.A. SMITH  
TM - L.A. SOBERBLOM  
TM - J. VEVERKA  
TM - J.B. WELLMAN

US GEOLOGICAL SURVEY  
LOMELL OBSERVATORY  
US GEOLOGICAL SURVEY  
NASA HEADQUARTERS  
SCIENCE APPL. INC  
NASA-JPL  
SCIENCE APPL. INC  
ARIZONA STATE U  
U OF LONDON  
US GEOLOGICAL SURVEY  
U OF ARIZONA  
US GEOLOGICAL SURVEY  
CORNELL U  
NASA-JPL

BRIEF DESCRIPTION

THE VIKING VISUAL IMAGING SUBSYSTEM (VIS) CONSISTED OF TWIN HIGH-RESOLUTION, SLOW-SCAN TELEVISION FRAMING CAMERAS MOUNTED ON THE SCAN PLATFORM OF EACH ORBITER WITH THE OPTICAL AXES OFFSET BY 1.38 DEG. EACH OF THE TWO IDENTICAL CAMERAS ON EACH ORBITER HAD A 475-MM FOCAL LENGTH TELESCOPES; A 37-MM DIAMETER VIDICON, THE CENTRAL SECTION OF WHICH WAS SCANNED IN A RASTER FORMAT OF 1056 LINES BY 1102 SAMPLES; AND SIX COLOR FILTERS TO RESTRICT THE SPECTRAL BANDPASS OF AN IMAGE TO LIMITED PORTIONS OF THE CAMERAS' NEAR-VISUAL RESPONSE CHARACTERISTICS. EACH FIELD OF VIEW WAS 1.54 DEG X 1.61 DEG WITH EACH PICTURE ELEMENT (PIXEL) SUBTENDING 25 MILLIRADIANS. THE SLIGHT OFFSET OF THE OPTICAL AXES AND THE ALTERNATE SHUTTERING MODE OF OPERATION (THE INTERVAL BETWEEN FRAMES BEING 4.48 S) PROVIDED OVERLAPPING, WIDE-SWATH COVERAGE OF THE SURFACE. INDIVIDUAL IMAGES ARE IDENTIFIED BY PICTURE NUMBER (PICNO), WHICH IS A UNIQUE IDENTIFIER OF THE SCENE. ELEMENTS OF THE PICNO ARE AS FOLLOWS: THE FIRST THREE DIGITS DENOTE THE REVOLUTION (REV) DURING WHICH THE IMAGE WAS SHUTTERED; THE LETTER A IS VIKING ORBITER 1, B IS VIKING ORBITER 2; AND THE LAST TWO DIGITS ARE THE FRAME NUMBER.

----- VIKING 1 ORBITER, FARMER -----

INVESTIGATION NAME- MARS ATMOSPHERIC WATER DETECTION (MAWD)

NSSDC ID- 75-075A-03

INVESTIGATIVE PROGRAM

CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

TL - C.B. FARMER  
TM - D.D. LAPORTE  
TM - D.W. DAVIES

NASA-JPL  
SANTA BARBARA RES CTR  
NASA-JPL

BRIEF DESCRIPTION

THE MAWD USED AN INFRARED GRATING SPECTROMETER MOUNTED ON THE ORBITER SCAN PLATFORM THAT WAS BORESEIGHTED WITH THE TELEVISION CAMERAS AND THE IRTM. THE INSTRUMENT MEASURED SOLAR INFRARED RADIATION REFLECTED FROM THE SURFACE THROUGH THE ATMOSPHERE TO THE SPACECRAFT. SPECTRAL INTERVALS WERE SELECTED COINCIDENT WITH THE WAVELENGTH OF WATER VAPOR ABSORPTION LINES IN THE 1.4-MICRUMETER BAND. THE QUANTITY OF WATER VAPOR ALONG THE LINE OF SIGHT WAS MEASURED FROM 1 TO 100 MICRUMETERS OF PRECIPITABLE WATER WITH AN ACCURACY OF 5 PERCENT OR BETTER. THE INSTANTANEOUS FIELD OF VIEW OF THE INSTRUMENT WAS 2 X 17

MILLIRADIANS, AND A STEPPING MIRROR ROTATED THE LINE OF SIGHT THROUGH 15 POSITIONS TO PROVIDE A ROUGHLY RECTANGULAR FIELD OF VIEW OF 17 X 31 MILLIRADIANS.

----- VIKING 1 ORBITER, KIEFFER -----

INVESTIGATION NAME- INFRARED THERMAL MAPPING (IRTM)

NSSDC ID- 75-075A-02

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

TL - M.H. KIEFFER  
TM - G. MUNCH  
TM - E.B. MINER  
TM - G. NEUGEBAUER  
TM - S.C. CHASE, JR.  
TM - F.D. PALLUCONI

US GEOLOGICAL SURVEY  
CALIF INST OF TECH  
NASA-JPL  
CALIF INST OF TECH  
SANTA BARBARA RES CTR  
NASA-JPL

BRIEF DESCRIPTION

THE PURPOSE OF THE IRTM EXPERIMENT WAS TO MEASURE THE TEMPERATURES OF THE ATMOSPHERE AND AREAS ON THE SURFACE OF MARS. THE AMOUNT OF SUNLIGHT REFLECTED BY THE PLANET WAS ALSO MEASURED. THE IRTM WAS A MULTICHANNEL RADIOPETER MOUNTED ON THE ORBITER'S SCAN PLATFORM. FOUR SMALL TELESCOPES, EACH WITH SEVEN INFRARED DETECTORS, WERE AIMED PARALLEL TO THE VISUAL IMAGING OPTICAL AXIS, AND MADE OBSERVATIONS EVERY 1.12 S. THE INSTRUMENT WAS CAPABLE OF MEASURING DIFFERENCES OF 1 C THROUGHOUT A TEMPERATURE RANGE OF -130 DEG C TO +57 DEG C. THE FIELD OF VIEW WAS CIRCULAR, 5 MILLIRADIANS IN DIAMETER.

----- VIKING 1 ORBITER, MICHAEL, JR. -----

INVESTIGATION NAME- ORBITER RADIO SCIENCE

NSSDC ID- 75-075A-04

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY IONOSPHERES  
METEOROLOGY

PERSONNEL

TL - M.H. MICHAEL, JR.  
TM - I.I. SHAPIRO  
TM - G.F. LINDAL  
TM - J.G. DAVIES  
TM - D.L. CAIN  
TM - M.D. GROSSI  
TM - G.L. TYLER  
TM - J.P. BRENNKE  
TM - R.H. TOLSON  
TM - C.T. STELZRIED  
TM - G. BORN  
TM - R. REASENBERG

NASA-LARC  
MASS INST OF TECH  
NASA-JPL  
U OF MANCHESTER  
NASA-JPL  
RAYTHEON CORP  
STANFORD U  
NASA-JPL  
NASA-LARC  
NASA-JPL  
NASA-JPL  
MASS INST OF TECH

BRIEF DESCRIPTION

THERE ARE FOUR DISTINCT SETS OF VIKING RADIO SCIENCE DATA -- THREE USING ORBITER DATA AND ONE PRIMARILY USING LANDER DATA WITH CALIBRATIONS FROM ORBITER DATA. THE ORBITER TRACKING DATA, OBTAINED FROM THE TWO-WAY ORBITER-EARTH S-BAND AND X-BAND RADIO LINKS, CONSIST OF DOPPLER FREQUENCIES AND TIME-OF-FLIGHT RANGE MEASUREMENTS. THESE DETERMINED THE POSITION AND MOTION OF THE ORBITERS, AND CAN BE USED TO STUDY THE MARS GRAVITATIONAL FIELD, THE PLASMA IN INTERPLANETARY SPACE, AND THE STRUCTURE OF THE SOLAR CORONA. THE OCULTATION DATA WERE OBTAINED FROM THESE SAME RADIO LINKS BY ANALOG RECORDING OF THE SIGNAL WHEN A SPACECRAFT WAS PASSING INTO OR OUT OF OCULTATION WITH MARS. THE DATA CAN BE USED TO PRODUCE ALTITUDE PROFILES OF THE TEMPERATURE, DENSITY, AND PRESSURE OF THE ATMOSPHERE (INCLUDING THE IONOSPHERE) AND TO MEASURE THE RADIUS OF THE PLANET USING A LARGE NUMBER OF SURFACE POINTS. THE SURFACE PROPERTIES ASPECT OF THIS INVESTIGATION UTILIZED THE UHF (381 MHZ) SIGNAL ON WHICH THE LANDERS TRANSMITTED DATA TO THE ORBITERS. AT THE BEGINNING OR END OF A DATA TRANSMISSION SESSION, WHEN THE ORBITER WAS NEAR THE LANDER'S HORIZON, THE STRENGTH OF THE RECEIVED SIGNAL WAS RECORDED AS A FUNCTION OF TIME. THESE SIGNAL "FADE PATTERNS," RESULTING FROM INTERACTION OF THE RADIO WAVES WITH THE MARTIAN SURFACE, CONTAIN INFORMATION ABOUT THE PHYSICAL PROPERTIES OF THE SURFACE NEAR THE LANDERS. THE LANDER TRACKING DATA FROM THE TWO-WAY DIRECT LANDER-EARTH S-BAND LINKS PERMIT DETERMINATION OF THE LOCATION OF THE LANDERS AND STUDIES OF THE MOTION OF THE PLANET.

\*\*\*\*\* VIKING 2 LANDER \*\*\*\*\*

SPACECRAFT COMMON NAME- VIKING 2 LANDER  
ALTERNATE NAMES- VIKING-A LANDER

NSSDC ID- 75-083C

LAUNCH DATE- 09/09/75  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

WEIGHT- 598. KG

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- MARS LANDER

PERSONNEL

MG - W.	JAKOBOWSKI(RETired)	NASA HEADQUARTERS
SC - R.S.	YOUNG(RETired)	NASA HEADQUARTERS
PM - K.S.	WATKINS	NASA-JPL
PS - C.W.	SNYDER	NASA-JPL

BRIEF DESCRIPTION

THIS SPACECRAFT WAS THE LANDING VEHICLE FOR THE TWO-PART SPACECRAFT MISSION. IT SOFT-LANDED ON SEPTEMBER 3, 1976, IN THE UTOPIA REGION OF MARS AT 47.67 DEG N LATITUDE AND 225.71 DEG W LONGITUDE. THE LANDER CARRIED INSTRUMENTS TO STUDY THE BIOLOGY, CHEMICAL COMPOSITION (ORGANIC AND INORGANIC), METEOROLOGY, SEISMOLOGY, MAGNETIC PROPERTIES, SURFACE APPEARANCE, AND PHYSICAL PROPERTIES OF THE MARTIAN SURFACE AND ATMOSPHERE. THE LANDER HAD A 70-W POWER CAPACITY AND A SCIENTIFIC PAYLOAD OF APPROXIMATELY 91 KG (200 LB). SOME OF THE DATA COLLECTED WERE RETURNED BY DIRECT RADIO LINK TO EARTH, BUT MOST OF THE DATA WERE RETURNED BY RELAY THROUGH ONE OF THE ORBITERS. THE LANDER WAS APPROXIMATELY 3 M ACROSS AND ABOUT 2M HIGH.

----- VIKING 2 LANDER, HESS-----

INVESTIGATION NAME- METEOROLOGY

NSSDC ID- 75-083C-07 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

TL - S.L.	HESS	FLORIDA STATE U
TM - C.B.	LEOY	U OF WASHINGTON
TM - R.H.	HENRY	U OF WASHINGTON
TM - J.A.	RYAN	CALIF ST U, FULLERTON
TM - J.E.	TILLMAN	U OF WASHINGTON

BRIEF DESCRIPTION

THIS EXPERIMENT ANALYZED THE METEOROLOGICAL ENVIRONMENT NEAR THE PLANETARY SURFACE AND OBTAINED INFORMATION ABOUT MOTION SYSTEMS OF VARIOUS SCALES. THE ATMOSPHERIC PARAMETERS DETERMINED WERE PRESSURE, TEMPERATURE, WIND SPEED, AND WIND DIRECTION. DIURNAL AND SEASONAL VARIATIONS WERE OF PARTICULAR IMPORTANCE. THE SAMPLING RATES AND DURATIONS FOR ANY ONE MARTIAN DAY (SOL) WERE SELECTABLE BY GROUND COMMAND. THE SENSORS WERE MOUNTED ON AN ERECTED BOOM. THREE HOT-FILM ANEMOMETERS, THROUGH WHICH AN ELECTRIC CURRENT WAS PASSED TO HEAT TWO GLASS NEEDLES COATED WITH PLATINUM AND OVERCOATED WITH ALUMINUM OXIDE, WERE USED TO MEASURE WIND SPEED. THE ELECTRIC POWER NEEDED TO MAINTAIN THESE SENSORS AT A FIXED TEMPERATURE ABOVE THE SURROUNDING AIR WAS THE MEASURE OF WIND SPEED. ATMOSPHERIC TEMPERATURE WAS MEASURED BY THREE FINE-WIRE THERMOCOUPLES IN PARALLEL. A THIN METAL DIAPHRAGMA, MOUNTED IN A VACUUM-SEALED CASE, WAS USED TO MEASURE ATMOSPHERIC PRESSURE.

----- VIKING 2 LANDER, HUTCH-----

INVESTIGATION NAME- LANDER IMAGING

NSSDC ID- 75-083C-06 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
METEOROLOGY  
PLANETOLOGY

PERSONNEL

TL - T.A.	HUTCH	NASA HEADQUARTERS
TM - C.	SAGAN	CORNELL U
TM - A.B.	BINDER	U OF KIEL
TM - E.C.	MORRIS	US GEOLOGICAL SURVEY
TM - F.O.	HUCK	NASA-LARC
TM - E.C.	LEWINTHAL	STANFORD U
TM - S.	LIEBES, JR.	STANFORD U
TM - J.B.	POLLACK	NASA-ARC
TM - R.E.	ARVIDSON	WASHINGTON U

BRIEF DESCRIPTION

THE LANDER IMAGING EXPERIMENT VIEWED THE SCENE SURROUNDING THE LANDER, THE SURFACE SAMPLER AND OTHER PARTS OF THE LANDER, THE SUN, AND PHOBOS TO PROVIDE DATA FOR OPERATIONAL PURPOSES AND FOR GEOLOGICAL AND METEOROLOGICAL INVESTIGATIONS. TWO SCANNING CAMERAS, CAPABLE OF RESOLVING 0.04 DEG (HIGH RESOLUTION) OR 0.12 DEG (LOW RESOLUTION, COLOR, AND IR) WERE USED ON EACH LANDER. EACH IMAGE ACQUIRED COVERED A VERTICAL FIELD OF 20 DEG (HIGH RESOLUTION) OR 60 DEG (LOW RESOLUTION, COLOR, AND IR) AND A HORIZONTAL FIELD THAT WAS COMMANDABLE FROM 2.5 DEG TO 342.5 DEG IN 2.5-DEG INCREMENTS. IMAGES WERE ACQUIRED FROM 40 DEG ABOVE THE NOMINAL HORIZON TO 60 DEG BELOW, AND WERE COMMANDABLE IN 10-DEG INCREMENTS. THE CAMERAS WERE MOUNTED 1.3 M ABOVE THE NOMINAL LANDING PLANE AND WERE CAPABLE OF VIEWING TWO FOOTPADS AND MOST OF THE AREA ACCESSIBLE TO THE SURFACE SAMPLER. THE TWO CAMERAS WERE SEPARATED BY 0.6 M, AND STEREOGRAPHIC PICTURES WERE OBTAINED OVER MOST OF THE SCENE. BLACK AND WHITE IMAGES IN EITHER LOW OR HIGH RESOLUTION

INCLUDED RADIATION WAVELENGTHS FROM 0.4 TO 1.1 MICRONEETERS. THE USE OF A SINGLE DETECTOR TO IMAGE AN ENTIRE FRAME ALLOWED A RELATIVE RADIOMETRIC ACCURACY OF PLUS OR MINUS 10 PERCENT. FOR MORE INFORMATION CONCERNING THE CAMERAS, SEE HUCK ET AL., "SPACE SCIENCE INSTRUMENTATION 1," 189-241 (1979).

\*\*\*\*\* VOYAGER 1\*\*\*\*\*

SPACECRAFT COMMON NAME- VOYAGER 1  
ALTERNATE NAMES- MARINER JUPITER/SATURN A, OUTER PLANETS A  
MARINER 77A, MJS 77A  
10321

NSSDC ID- 77-084A

LAUNCH DATE- 09/05/77 WEIGHT- 700. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- SATURN FLVBY

PERSONNEL

MG - E.J.	MONTOYA	NASA HEADQUARTERS
SC - M.A.	MITZ	NASA HEADQUARTERS
PM - R.L.	MEACOCK	NASA-JPL
PS - E.C.	STONE	CALIF INST OF TECH

BRIEF DESCRIPTION

THE OVERALL OBJECTIVES OF VOYAGER WERE TO CONDUCT EXPLORATORY INVESTIGATIONS OF THE PLANETARY SYSTEMS OF JUPITER AND SATURN AND OF THE INTERPLANETARY MEDIUM OUT TO SATURN. PRIMARY EMPHASIS WAS PLACED ON COMPARATIVE STUDIES OF THESE TWO PLANETARY SYSTEMS BY OBTAINING (1) MEASUREMENTS OF THE ENVIRONMENT, ATMOSPHERE, AND BODY CHARACTERISTICS OF THE PLANETS AND ONE OR MORE OF THE SATELLITES OF EACH PLANET, (2) STUDIES OF THE NATURE OF THE RINGS OF SATURN, AND (3) EXPLORATION OF THE INTERPLANETARY (OR INTERSTELLAR) MEDIUM AT INCREASING DISTANCES FROM THE SUN. THESE OBJECTIVES WERE ATTAINED BY USING A VARIETY OF INSTRUMENTS AND METHODS INCLUDING IMAGING, A COHERENT S- AND X-BAND RF RECEIVER, AN INFRARED INTERFEROMETER, AND RADIOPETER, UV SPECTROMETER, FLUORIC MAGNETOMETERS, FARADAY CUPS, A CHARGED PARTICLE ANALYZER, PLASMA DETECTOR, PLASMA WAVE RADIO RECEIVER, COSMIC RAY TELESCOPES, PHOTOPOLARIMETER, AND A SWEEP FREQUENCY RADIO RECEIVER. VOYAGER 1 HAD ITS CLOSEST ENCOUNTER WITH JUPITER ON MARCH 5, 1979.

----- VOYAGER 1, BRIDGE-----

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-084A-06 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS

PERSONNEL

PI - H.S.	BRIDGE	NASS INST OF TECH
CI - J.W.	BELCHER	NASS INST OF TECH
CI - C.R.	GOERTZ	MPI-AERONOMY
CI - A.J.	LAZARUS	NASS INST OF TECH
CI - S.	OLBERT	NASS INST OF TECH
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.F.	BURLAGA	NASA-GSFC
CI - R.E.	FARRELL	NASA-GSFC
CI - K.W.	OGILIVE	NASA-GSFC
CI - G.L.	SISCOE	U OF CALIF., LA
CI - A.J.	MUNDHAUSEN	NATL CTR FOR ATOMS RES
CI - J.D.	SULLIVAN	MASS INST OF TECH
CI - C.W.	TEATES	NASA-JPL
CI - J.D.	SCUDER	NASA-GSFC

BRIEF DESCRIPTION

THE PLASMA INVESTIGATION MADE USE OF TWO FARADAY CUP DETECTORS, ONE POINTED ALONG THE EARTH-SPACECRAFT LINE AND ONE AT RIGHT ANGLES TO THIS LINE. THE EARTH-POINTING DETECTOR DETERMINED THE MACROSCOPIC PROPERTIES OF THE PLASMA IONS, OBTAINING ACCURATE VALUES OF THEIR VELOCITY, DENSITIES, AND PRESSURE. THREE SEQUENTIAL ENERGY SCANS WERE EMPLOYED WITH  $(\Delta E)/E$  EQUAL TO 20, 7.2, AND 1.8 PERCENT, ALLOWING A COVERAGE FROM SUBSONIC TO HIGHLY SUPERSONIC FLOW. THE SIDE-LOOKING FARADAY CUP MEASURED ELECTRONS IN THE ENERGY RANGE FROM 5 EV TO 1 KEV.

----- VOYAGER 1, BROADFOOT-----

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-084A-04 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

ORIGINAL PAGE IS  
OF POOR QUALITY

**PERSONNEL**

PI - A.L. BROADFOOT	U OF SOUTHERN CALIF
CI - H.W. MOORE	JOHNS HOPKINS U
CI - M.J.S. BELTON	KITT PEAK NATL OBS
CI - D.F. STROBEL	US NAVAL RESEARCH LAB
CI - T.M. DONAHUE	U OF MICHIGAN
CI - W.B. MCILROY	HARVARD U
CI - J.C. MCCONNELL	YALE U
CI - R.N. GOODY	HARVARD U
CI - A. DALGARNO	SAO
CI - J.E. BLAERONT	CNRS-SA
CI - J.L. BERTAUX	CNRS-SA
CI - S.K. ATREY	U OF MICHIGAN
CI - B.R. SANDEL	U OF SOUTHERN CALIF
CI - D.E. SHENKSY	U OF SOUTHERN CALIF

**BRIEF DESCRIPTION**

THE UV SPECTROMETER WAS DESIGNED TO MEASURE ATMOSPHERIC PROPERTIES AND MEASURE RADIATION IN THE WAVELENGTH RANGE FROM 400 TO 1600 Å. TWO MODES OF INSTRUMENT OPERATION WERE PLANNED, AIRGLOW AND OCCULTATION. IN THE AIRGLOW MODE THE ATMOSPHERIC RADIATION WAS MEASURED. THIS RADIATION IS PREDOMINANTLY RESONANCE-SCATTERED SOLAR RADIATION, WHERE THE SCATTERING IS BY MOLECULAR OR ATOMIC ATMOSPHERIC CONSTITUENTS SUCH AS, HYDROGEN (1216 Å) OR HELIUM (584 Å). IN THE OCCULTATION MODE SUNLIGHT IS REFLECTED INTO THE SPECTROMETER, AND THE SOLAR SPECTRUM WAS RECORDED. AS THE ATMOSPHERE MOVED BETWEEN THE SPACECRAFT AND THE SUN, THE ABSORPTION CHARACTERISTICS OF THE ATMOSPHERE WERE OBTAINED OVER THE MEASURED WAVELENGTH REGION. THE ABSORPTION SPECTRUM WAS USED TO IDENTIFY THE ABSORBER AS WELL AS TO MEASURE ITS ABUNDANCE IN THE LINE OF SIGHT TO THE SUN. IN ADDITION, THE ATMOSPHERIC THERMAL STRUCTURE COULD BE INFERRED.

----- VOYAGER 1, LANE -----

**INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY**

NSSDC ID- 77-084A-03

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - R.A. HANEL	NASA-GSFC
CI - V.G. KUNDE	NASA-GSFC
CI - D.P. CRUIKSHANK	U OF HAWAII
CI - W.C. MAGUIRE	NASA-GSFC
CI - J.C. PEARL	NASA-GSFC
CI - J.A. PIRAGLIA	NASA-GSFC
CI - R.E. SAMUELSON	NASA-GSFC
CI - P.J. GIERASCH	CORNELL U
CI - C.A. PONHAMPERUMA	U OF MARYLAND
CI - D. GAUTIER	PARIJS OBSERVATORY
CI - F.M. FLASAR	NASA-GSFC
CI - S. KUNAR	U OF SOUTHERN CALIF

**BRIEF DESCRIPTION**

THIS INVESTIGATION WAS CARRIED OUT USING AN INFRARED RADIOMETER AND AN INTERFEROMETER SPECTROMETER SIMILAR IN DESIGN TO THE MARINER MARS-71 IRIS, COMBINED INTO A SINGLE INSTRUMENT. THE INVESTIGATION STUDIED BOTH GLOBAL AND LOCAL ENERGY BALANCE, USING INFRARED SPECTRAL MEASUREMENTS IN CONJUNCTION WITH BROAD-BAND MEASUREMENTS OF REFLECTED SOLAR ENERGY. ATMOSPHERIC COMPOSITION WAS ALSO INVESTIGATED, INCLUDING DETERMINATION OF THE H<sub>2</sub>/HE RATIO, AND THE ABUNDANCE OF CH<sub>2</sub> AND NH<sub>3</sub>. VERTICAL TEMPERATURE PROFILES WERE OBTAINED ON THE PLANETS AND SATELLITES WITH ATMOSPHERES. STUDIES OF THE COMPOSITION, THERMAL PROPERTIES, AND SIZE OF PARTICLES IN SATURN'S RINGS WILL BE CONDUCTED. THE INTERFEROMETER HAS A SPECTRAL RANGE OF 200 TO 4000 1/CM, WHILE THE RADIOMETER RANGE COVERS 5000 TO 35,000 1/CM. THE INSTRUMENT USES A SINGLE PRIMARY MIRROR 51 CM IN DIAM WITH A FIELD OF VIEW OF 0.25 DEG.

----- VOYAGER 1, KRIMIGIS -----

**INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE**

NSSDC ID- 77-084A-07

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
COSMIC RAYS  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - S.M. KRIMIGIS	APPLIED PHYSICS LAB
CI - C.Y. FAN	U OF ARIZONA
CI - G. GLOECKLER	U OF MARYLAND
CI - L.J. LANZEROTTI	BELL TELEPHONE LAB
CI - T.P. ARMSTRONG	U OF KANSAS
CI - W.I. AXFORD	MPI-AERONOMY
CI - C.O. BOSTROM	APPLIED PHYSICS LAB
CI - E.P. KEATH	APPLIED PHYSICS LAB

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT WAS TO STUDY THE MAGNETOSPHERES OF JUPITER AND SATURN USING A LOW-ENERGY MAGNETOSPHERIC PARTICLE ANALYZER. THIS DETECTOR MADE MEASUREMENTS IN (1) THE DISTANT MAGNETOSPHERE AND BOW SHOCK OF JUPITER, (2) THE POSSIBLE MAGNETOSPHERE OF SATURN, AND (3) THE TRAPPED RADIATION BELTS IN THE VICINITY OF JUPITER. ADDITIONALLY, THIS DETECTOR WAS ABLE TO STUDY LOW-ENERGY PARTICLES IN THE INTERPLANETARY MEDIUM. THE ENERGY RANGE OF THIS DETECTOR WAS 10 KEV TO 1.1 MEV FOR ELECTRONS AND 10 KEV TO 150 MEV FOR IONS. DURING THE INTERPLANETARY CRUISE PERIOD, PROTONS, ALPHA PARTICLES, AND HEAVIER NUCLEI (Z FROM 3 TO 26) WERE SEPARATELY IDENTIFIED AND THEIR ENERGY MEASURED IN THE RANGE FROM 0.05 TO 30 MEV, USING A LOW-ENERGY PARTICLE TELESCOPE.

----- VOYAGER 1, LANE -----

**INVESTIGATION NAME- MULTIFILTER PHOTOPOLARIMETER,**  
2200-7300 Å

NSSDC ID- 77-084A-11

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
INTERPLANETARY DUST  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - A.L. LANE	NASA-JPL
CI - K. PANG	SCIENCE APPL. INC
CI - J.E. HANSEN	NASA-GISSL
CI - D.L. COFFEEN	NASA-GISSL
CI - L. ESPOSITO	U OF COLORADO
CI - M. SATO	NASA-GISSL
CI - R. WEST	U OF COLORADO

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF AN 8 IN. F/1.1 TELESCOPE THAT COULD SEND ITS OBSERVATIONS THROUGH A POLARIZER AND A FILTER FOR ONE OF EIGHT BANDS IN THE 2200- TO 7300-Å SPECTRAL REGION, THEN ON TO A PHOTOMULTIPLIER TUBE. BY STUDY OF THESE EMISSION INTENSITY DATA, INFORMATION ON SURFACE TEXTURE AND COMPOSITION OF BOTH PLANETS (JUPITER AND SATURN) COULD BE OBTAINED, ALONG WITH INFORMATION ON SIZE DISTRIBUTION AND COMPOSITION OF THE SATURN RINGS AND INFORMATION ON ATMOSPHERIC SCATTERING PROPERTIES AND DENSITY FOR BOTH PLANETS. MOLECULAR SCALE HEIGHTS FOR BOTH PLANETS COULD ALSO BE DETERMINED FROM THESE DATA.

----- VOYAGER 1, NESS -----

**INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS**

NSSDC ID- 77-084A-05

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY MAGNETIC FIELD  
PARTICLES AND FIELDS  
INTERPLANETARY MAGNETIC FIELDS

**PERSONNEL**

PI - N.F. NESS	NASA-GSFC
CI - M.M. ACUNA	NASA-GSFC
CI - K.W. BEHNANON	NASA-GSFC
CI - L.F. BURLAGA	NASA-GSFC
CI - R.P. LEPPING	NASA-GSFC
CI - F.M. NEUBAUER	BRAUNSCHWEIG TECH U

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO INVESTIGATE THE MAGNETIC FIELDS OF JUPITER AND SATURN, THE SOLAR WIND INTERACTION WITH THE MAGNETOSPHERES OF THESE PLANETS, AND THE INTERPLANETARY MAGNETIC FIELD TO THE EXTENT OF THE SOLAR WIND BOUNDARY WITH THE INTERSTELLAR MAGNETIC FIELD AND BEYOND, IF CROSSED. THE INVESTIGATION WAS CARRIED OUT USING TWO HIGH-FIELD AND TWO LOW-FIELD TRIAXIAL FLUXGATE MAGNETOMETERS. DATA ACCURACY OF THE INTERPLANETARY FIELDS WAS PLUS OR MINUS 0.1 NT, AND THE RANGE OF MEASUREMENTS IS FROM 0.01 NT TO 2.E-3 T.

----- VOYAGER 1, SCARF -----

**INVESTIGATION NAME- PLASMA WAVE (.01-56 KHZ)**

NSSDC ID- 77-084A-13

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
PLANETARY IONOSPHERES

**PERSONNEL**

PI - F.L. SCARF	TRW SYSTEMS GROUP
CI - D.A. GURNETT	U OF IOWA

**BRIEF DESCRIPTION**

THIS INVESTIGATION PROVIDED CONTINUOUS, SHEATH-INDEPENDENT MEASUREMENTS OF THE ELECTRON DENSITY PROFILES AT JUPITER AND SATURN. IT ALSO GAVE BASIC INFORMATION ON LOCAL WAVE-PARTICLE INTERACTION REQUIRED TO CARRY OUT COMPARATIVE STUDIES OF THE PHYSICS OF THE JUPITER AND SATURN MAGNETOSPHERES. THE INSTRUMENTATION CONSISTED OF A 16-CHANNEL STEP FREQUENCY RECEIVER AND A LOW-FREQUENCY WAVEFORM RECEIVER WITH ASSOCIATED ELECTRONICS. THE FREQUENCY RANGE FOR THIS INSTRUMENT WAS FROM 10 Hz TO 56 kHz. THIS INSTRUMENT SHARED THE 10-M ANTENNAS DEVELOPED FOR THE PLANETARY RADIO ASTRONOMY INVESTIGATION.

----- VOYAGER 1, SMITH -----

**INVESTIGATION NAME- IMAGING**

NSSDC ID- 77-084A-01

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
METEOROLOGY  
PLANETARY ATMOSPHERES  
PLANETOLOGY  
ATMOSPHERIC PHYSICS

**PERSONNEL**

TL - B.A. SMITH	U OF ARIZONA
DT - L.A. SODERBLOM	US GEOLOGICAL SURVEY
TM - G.A. BRIGGS	NASA HEADQUARTERS
TM - A.F. COOK	SAO
TM - G.E. DANIELSON	CALIF INST OF TECH
TM - M.E. DAVIES	RAND CORP
TM - G.E. HUNT	U COLLEGE LONDON
TM - T. OWEN	STATE U OF NEW YORK
TM - C. SAGAN	CORNELL U
TM - V.E. SUURI	U OF WISCONSIN
TM - T.V. JOHNSON	NASA-JPL
TM - H. MASURSKY	US GEOLOGICAL SURVEY

**BRIEF DESCRIPTION**

THE PHOTOGRAPHIC EXPERIMENT USED A TWO-CAMERA SYSTEM, BASED ON THE MARINER 10 SYSTEM. THIS SYSTEM INCLUDED ONE NARROW-ANGLE, LONG FOCAL LENGTH CAMERA AND ONE WIDE-ANGLE, SHORT FOCAL LENGTH CAMERA. THE MAXIMUM RESOLUTION ACHIEVABLE DEPENDED ON THE ACTUAL TRAJECTORY ON THIS MULTI-ENCOUNTER MISSION, BUT THE RESOLUTION WAS AS HIGH AS 0.5 TO 1.0 KM ON THE CLOSEST APPROACHES TO SOME OBJECTS. AT JUPITER AND SATURN, THE RESOLUTION WAS EXPECTED TO BE 20 KM AND 5 KM, RESPECTIVELY. THE OBJECTIVES OF THE EXPERIMENT WERE TO PHOTOGRAPH GLOBAL MOTIONS AND CLOUD DISTRIBUTIONS ON JUPITER AND SATURN; GROSS DYNAMICAL PROPERTIES, ZONAL ROTATION, ORIENTATION OF SPIN AXIS, ZONAL SHEAR, VERTICAL SHEAR, FLOW INSTABILITIES, SPOTS, AND SPECTRUM OF SCALE OF ATMOSPHERIC MOTIONS IN TIME AND SPACE. ADDITIONAL OBJECTIVES INCLUDED THE STUDY OF THE MODE OF RELEASE OF INTERNAL ENERGY FLUX (SEARCH FOR CONVECTION CELLS AND ROLLS), STUDY OF GROWTH, DISSIPATION, MORPHOLOGY, AND VERTICAL STRUCTURE OF CLOUD COMPLEXES; GROSS OPTICAL PROPERTIES, GLOBAL AND LOCALIZED SCATTERING FUNCTION IN THE VISIBLE SPECTRUM; POLARIMETRY, NATURE OF CHROMOPHORES, THEIR STRUCTURE AND DEVELOPMENT, AND HIGH RESOLUTION OF THE GREAT RED SPOT. THE OBJECTIVES OF THE SATELLITE ENCOUNTERS INCLUDED: (1) GROSS CHARACTERISTICS - SIZE, SHAPE, ROTATION, SPIN AXIS, CARTOGRAPHY, IMPROVED EPHEMERIDES AND MASSES, (2) GEODESY -- MAJOR PHYSIOGRAPHIC PROVINCES, IMPACT AND VOLCANIC FEATURES, LINEAMENTS, POLAR CAPS, EROSION PROCESSES, AND LOW- AND HIGH-DENSITY SATELLITE COMPARATIVE STUDIES, DETECTION OF ATMOSPHERES, FROSTS, AND LIMB STRATIFICATION OF AEROSOLS; (3) SURFACE PROPERTIES - COLORIMETRY, SCATTERING FUNCTION, NATURE OF BRIGHTNESS VARIATION, AND SEARCH FOR NEW SATELLITES. STUDIES OF SATURN'S RINGS INCLUDED: (1) RESOLUTION OF INDIVIDUAL RING COMPONENTS OR CLUMPS OF MATERIAL, (2) VERTICAL AND RADIAL DISTRIBUTION OF MATERIAL OF VERY HIGH RESOLUTION, (3) SCATTERING FUNCTION, (4) COARSE POLARIMETRY, (5) OCCULTATION - OPTICAL DEPTH, AND (6) DISTINGUISHING DIFFERENT TYPES OF MATERIAL IN THE RINGS. OTHER OBJECTIVES WERE TO SEARCH FOR NEW COMETS, ASTEROIDS, AND TARGETS OF OPPORTUNITY.

----- VOYAGER 1, TYLER -----

**INVESTIGATION NAME- RADIO SCIENCE TEAM**

NSSDC ID- 77-084A-02

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
CELESTIAL MECHANICS  
IONOSPHERES AND RADIO PHYSICS

**PERSONNEL**

TL - G.L. TYLER	STANFORD U
TM - V.R. ESHLEMAN	STANFORD U
TM - J.D. ANDERSON	NASA-JPL
TM - T.A. CROFT	SRI INTERNATIONAL
TM - G.F. LINDAL	NASA-JPL
TM - G.S. LEVY	NASA-JPL
TM - G.E. WOOD	NASA-JPL

**BRIEF DESCRIPTION**

THE RADIO SCIENCE TEAM USED THE TELECOMMUNICATIONS SYSTEM OF THE VOYAGER SPACECRAFT TO PERFORM THEIR STUDIES. THE SYSTEM WAS A COHERENT S- AND X-BAND DOWNLINK AND S-BAND UPLINK. THE SCIENCE OBJECTIVES OF THE RADIO SCIENCE INVESTIGATION WERE: (1) DETERMINE THE PHYSICAL PROPERTIES OF PLANETARY AND SATELLITE IONOSPHERES AND ATMOSPHERES BY EXAMINING THE PROPAGATION EFFECTS ON A DUAL-FREQUENCY RADIO SIGNAL DURING IMMERSION AND EMERGENCE OF SPACECRAFT OCCULTATION BY THE SUBJECT BODY, (2) DETERMINE PLANETARY AND SATELLITE MASSES, GRAVITY FIELDS, AND DENSITIES BY PRECISE TRACKING OF A DUAL-FREQUENCY RADIO SIGNAL FROM THE SPACECRAFT DURING THE ENCOUNTER PERIOD, AND (3) DETERMINE THE AMOUNT AND SIZE DISTRIBUTION OF MATERIAL IN SATURN'S RINGS AND THE RING DIMENSIONS BY EXAMINING THE PROPAGATION EFFECTS ON A DUAL-FREQUENCY RADIO SIGNAL THAT PASSES THROUGH EACH RING IN SUCCESSION, AND THROUGH THE GAP BETWEEN THE C RING AND SATURN'S SURFACE.

----- VOYAGER 1, VOGT -----

**INVESTIGATION NAME- HIGH- AND MODERATELY LOW-ENERGY COSMIC-RAY TELESCOPE**

NSSDC ID- 77-084A-08

**INVESTIGATIVE PROGRAM**  
CODE SL

**INVESTIGATION DISCIPLINE(S)**  
COSMIC RAYS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - R.E. VOGT	CALIF INST OF TECH
CI - J.R. JOKIPII	U OF ARIZONA
CI - E.C. STONE	CALIF INST OF TECH
CI - F.B. McDONALD	NASA-GSFC
CI - J.H. TRAIVOR	NASA-GSFC
CI - W.R. WEBBER	U OF NEW HAMPSHIRE
CI - A.W. SCHARDT	NASA-GSFC

**BRIEF DESCRIPTION**

THIS INVESTIGATION STUDIED THE ORIGIN AND ACCELERATION PROCESS, LIFE HISTORY, AND DYNAMIC CONTRIBUTION OF INTERSTELLAR COSMIC RAYS, THE NUCLEOSYNTHESIS OF ELEMENTS IN COSMIC-RAY SOURCES, THE BEHAVIOR OF COSMIC RAYS IN THE INTERPLANETARY MEDIUM, AND THE TRAPPED PLANETARY ENERGETIC PARTICLE ENVIRONMENT. THE INSTRUMENTATION INCLUDED A HIGH-ENERGY TELESCOPE SYSTEM (HETS) AND A LOW-ENERGY TELESCOPE SYSTEM (LETS). THE HETS COVERED AN ENERGY RANGE BETWEEN 6 AND 500 MEV/NUCLEON FOR NUCLEI RANGING IN ATOMIC NUMBERS FROM 1 THROUGH 30. IN ADDITION, ELECTRONS IN THE ENERGY RANGE BETWEEN 3 AND 100 MEV/NUCLEON WERE MEASURED BY THIS TELESCOPE AND AN ELECTRON TELESCOPE (ETE). THE LETS MEASURED THE ENERGY AND DETERMINED THE IDENTITY OF NUCLEI FOR ENERGIES BETWEEN .15 AND 30 MEV/NUCLEON AND ATOMIC NUMBERS FROM 1 TO 30. THE INSTRUMENTS ALSO MEASURED THE ANISOTROPIES OF ELECTRONS AND NUCLEI. IN ADDITION, ELECTRONS IN THE ENERGY RANGE BETWEEN 3 AND 100 MEV/NUCLEON WERE MEASURED BY AN ELECTRON TELESCOPE (ETE).

----- VOYAGER 1, WARWICK -----

**INVESTIGATION NAME- PLANETARY RADIO ASTRONOMY**

NSSDC ID- 77-084A-10

**INVESTIGATIVE PROGRAM**  
CODE SL/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS

**PERSONNEL**

PI - J.W. WARWICK	RADIOPHYSICS, INC
CI - J.K. ALEXANDER, JR.	NASA-GSFC
CI - T.D. CARR	U OF FLORIDA
CI - F.T. HADDOCK	U OF MICHIGAN
CI - D.H. STAELIN	MASS INST OF TECH
CI - A. BOISCHOT	PARIS OBSERVATORY
CI - C.C. HARVEY	PARIS OBSERVATORY
CI - Y. LEBLANC	PARIS OBSERVATORY
CI - W.E. BROWN, JR.	NASA-JPL
CI - S. GULKIS	NASA-JPL
CI - R. PHILLIPS	NASA-JPL
CI - J.B. PEARCE	RADIOPHYSICS, INC
CI - A.C. RIDDLE	U OF COLORADO
CI - R.G. PELTZER	MARTIN-MARIETTA AEROSP
CI - M.L. KAISER	NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTED OF A SWEEP-FREQUENCY RADIO RECEIVER OPERATING IN BOTH POLARIZATION STATES, BETWEEN 20 kHz AND 40.5 MHz. THE SIGNAL WAS RECEIVED BY A PAIR OF ORTHOGONAL 10-M MONPOLE ANTENNAS. STUDY OF THE RADIO EMISSION SIGNALS FROM JUPITER AND SATURN OVER THIS RANGE OF FREQUENCIES YIELDED DATA CONCERNING THE PHYSICS OF MAGNETOSPHERIC PLASMA RESONANCES AND NONTHERMAL RADIO EMISSIONS FROM THESE PLANETARY REGIONS.

\*\*\*\*\* VOYAGER 2 \*\*\*\*\*

**SPACECRAFT COMMON NAME- VOYAGER 2**  
**ALTERNATE NAMES- MARINER JUPITER/SATURN B, OUTER PLANETS B**  
MARINER 77B, MJS 77B  
10271

NSSDC ID- 77-076A

LAUNCH DATE- 08/20/77 WEIGHT- 700. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSR

INITIAL ORBIT PARAMETERS  
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG - E.J. MONTOMA NASA HEADQUARTERS  
SC - R.A. RITZ NASA HEADQUARTERS  
PM - R.L. HEACOCK NASA-JPL  
PS - E.C. STONE CALIF INST OF TECH

BRIEF DESCRIPTION

THE OVERALL OBJECTIVES OF VOYAGER 2 WERE TO CONDUCT EXPLORATORY INVESTIGATIONS OF THE PLANETARY SYSTEMS OF JUPITER AND SATURN AND OF THE INTERPLANETARY MEDIUM OUT TO SATURN. PRIMARY EMPHASIS WAS PLACED ON COMPARATIVE STUDIES OF THESE TWO PLANETARY SYSTEMS BY OBTAINING (1) MEASUREMENTS OF THE ENVIRONMENT, ATMOSPHERE, AND BODY CHARACTERISTICS OF THE PLANETS AND ONE OR MORE OF THE SATELLITES OF EACH PLANET, (2) STUDIES OF THE NATURE OF THE RINGS OF SATURN, AND (3) EXPLORATION OF THE INTERPLANETARY (OR INTERSTELLAR) MEDIUM AT INCREASING DISTANCES FROM THE SUN. THESE OBJECTIVES WERE MET USING A VARIETY OF INSTRUMENTS AND METHODS INCLUDING IMAGING, A COHERENT S- AND X-BAND RF RECEIVER, AN IR INTERFEROMETER AND RADIOMETER, A UV SPECTROMETER, FLUXGATE MAGNETOMETERS, FARADAY CUPS, A CHARGED PARTICLE ANALYZER, PLASMA DETECTOR, PLASMA WAVE RADIO RECEIVER, COSMIC-RAY TELESCOPES, PHOTOPOLARIMETER, AND A SWEEP FREQUENCY RADIO RECEIVER. JUPITER CLOSE ENCOUNTER WAS ACHIEVED ON JULY 9, 1979.

----- VOYAGER 2, BRIDGE -----

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-076A-06 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - H.S. BRIDGE MASS INST OF TECH  
CI - A.J. LAZARUS MASS INST OF TECH  
CI - S. OLBERT MASS INST OF TECH  
CI - J.W. BELCHER MASS INST OF TECH  
CI - V.M. VASYLIUNAS MPI-AERONOMY  
CI - L.F. BURLAGA NASA-GSFC  
CI - C.K. GOERTZ MPI-AERONOMY  
CI - G.L. SISCOE U OF CALIF, LA  
CI - A.J. HUNDHAUSEN NATL CTR FOR ATMOS RES  
CI - R.E. HARTLE NASA-GSFC  
CI - K.W. OGILVIE NASA-GSFC  
CI - J.D. SULLIVAN MASS INST OF TECH  
CI - C.M. YEATES NASA-JPL  
CI - J.D. SCUDER NASA-GSFC

BRIEF DESCRIPTION

THE PLASMA INVESTIGATION MADE USE OF TWO FARADAY CUP DETECTORS, ONE POINTED ALONG THE EARTH-SPACECRAFT LINE AND ONE AT RIGHT ANGLES TO THIS LINE. THE EARTH-POINTING DETECTOR DETERMINED THE MACROSCOPIC PROPERTIES OF THE PLASMA IONS, OBTAINING ACCURATE VALUES OF THEIR VELOCITY, DENSITIES, AND PRESSURE. THREE SEQUENTIAL ENERGY SCANS WERE EMPLOYED WITH  $(\Delta E)/E$  EQUAL TO 29%, 7.2%, AND 1.8 PERCENT, ALLOWING A COVERAGE FROM SUBSONIC TO HIGHLY SUPERSONIC FLOW. THE SIDE-LOOKING FARADAY CUP MEASURED ELECTRONS IN THE ENERGY RANGE FROM 5 EV TO 1 KEV.

----- VOYAGER 2, BROADFOOT -----

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-076A-04 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L. BROADFOOT U OF SOUTHERN CALIF  
CI - A. DALGARNO SAO  
CI - J.C. MCCONNELL YORK U  
CI - R.M. GOODY HARVARD U  
CI - T.M. DONAHUE U OF MICHIGAN  
CI - M.B. MCELROY HARVARD U  
CI - M.J.S. BELTON KITT PEAK NATL OBS  
CI - D.F. STROBEL US NAVAL RESEARCH LAB  
CI - H.W. ROOS JOHNS HOPKINS U  
CI - J.E. BLAMONT CNRS-SA  
CI - J.L. BERTAUX CNRS-SA  
CI - S.K. ATREYA U OF MICHIGAN  
CI - B.R. SANDEL U OF SOUTHERN CALIF  
CI - D.E. SHEMANSKY U OF SOUTHERN CALIF

BRIEF DESCRIPTION

THE UV SPECTROMETER WAS DESIGNED TO MEASURE ATMOSPHERIC PROPERTIES AND MEASURED RADIATION IN THE WAVELENGTH RANGE FROM 400 TO 1600 Å. TWO MODES OF INSTRUMENT OPERATION WERE PLANNED, AIRGLOW AND OCCULTATION. IN THE AIRGLOW MODE THE ATMOSPHERIC RADIATION WAS MEASURED. THIS RADIATION IS PREDOMINANTLY RESONANCE-SCATTERED SOLAR RADIATION, WHERE THE SCATTERING WILL BE BY THE MOLECULAR OR ATOMIC ATMOSPHERIC CONSTITUENTS SUCH AS, FOR EXAMPLE, HYDROGEN (1216 Å) OR HELIUM (588 Å). IN THE OCCULTATION MODE SUNLIGHT WAS REFLECTED INTO THE SPECTROMETER, AND THE SOLAR SPECTRUM WAS RECORDED. AS THE ATMOSPHERE MOVES BETWEEN THE SPACECRAFT AND THE SUN, THE ABSORPTION CHARACTERISTICS OF THE ATMOSPHERE WERE OBTAINED OVER THE MEASURED WAVELENGTH REGION. THE ABSORPTION SPECTRUM WAS USED TO IDENTIFY THE ABSORBER AS WELL AS TO MEASURE ITS ABUNDANCE IN THE LINE OF SIGHT TO THE SUN. IN ADDITION, THE ATMOSPHERE'S THERMAL STRUCTURE COULD BE INFERRED.

----- VOYAGER 2, HANEL -----

INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY

NSSDC ID- 77-076A-03

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.A. HANEL	NASA-GSFC
CI - C.A. PONNAMPERUMA	U OF MARYLAND
CI - P.J. GIERASCH	CORNELL U
CI - J.A. PIARAGLIA	NASA-GSFC
CI - R.E. SAMUELSON	NASA-GSFC
CI - W.C. MAGUIRE	NASA-GSFC
CI - J.C. PEARL	NASA-GSFC
CI - V.G. KUNDE	NASA-GSFC
CI - D.P. CRUIKSHANK	U OF HAWAII
CI - B.J. CONRATH	NASA-GSFC
CI - D. GAUTIER	PARIS OBSERVATORY
CI - F.M. FLASAR	NASA-GSFC
CI - S. KUMAR	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

THIS INVESTIGATION WAS CARRIED OUT USING AN INFRARED RADIOMETER AND AN INTERFEROMETER SPECTROMETER SIMILAR IN DESIGN TO THE MARINER MARS-71 IRIS, COMBINED INTO A SINGLE INSTRUMENT. THE INVESTIGATION STUDIED BOTH GLOBAL AND LOCAL ENERGY BALANCE, USING INFRARED SPECTRAL MEASUREMENTS IN CONJUNCTION WITH BROAD-BAND MEASUREMENTS OF REFLECTED SOLAR ENERGY. ATMOSPHERIC COMPOSITION WAS ALSO INVESTIGATED, INCLUDING DETERMINATION OF THE H<sub>2</sub>/HE RATIO, AND THE ABUNDANCE OF CH<sub>2</sub> AND N<sub>2</sub>S. VERTICAL TEMPERATURE PROFILES WERE OBTAINED ON THE PLANETS AND SATELLITES WITH ATMOSPHERES. STUDIES OF THE COMPOSITION, THERMAL PROPERTIES, AND SIZE OF PARTICLES IN SATURN'S RINGS WERE CONDUCTED. THE INTERFEROMETER HAD A SPECTRAL RANGE OF 200 TO 4000 1/CM, WHILE THE RADIOMETER RANGE COVERED 5000 TO 33,000 1/CM. THE INSTRUMENT USED A SINGLE PRIMARY MIRROR 51 CM IN DIAM WITH A FIELD OF VIEW OF 0.25 DEG.

----- VOYAGER 2, KRIMIGIS -----

INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE

NSSDC ID- 77-076A-07

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - S.M. KRIMIGIS	APPLIED PHYSICS LAB
CI - C.O. BOSTROM	APPLIED PHYSICS LAB
CI - T.P. ARMSTRONG	U OF KANSAS
CI - W.I. AXFORD	MPI-AERONOMY
CI - G. GLOECKLER	U OF MARYLAND
CI - L.J. LANZEROTTI	BELL TELEPHONE LAB
CI - C.Y. FAN	U OF ARIZONA
CI - E.P. KEATH	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT WAS TO STUDY THE MAGNETOSPHERES OF JUPITER AND SATURN USING A LOW-ENERGY MAGNETOSPHERIC PARTICLE ANALYZER. THIS DETECTOR MADE MEASUREMENTS IN (1) THE DISTANT MAGNETOSPHERE AND ROLL SHOCK OF JUPITER, (2) THE POSSIBLE MAGNETOSPHERE OF SATURN, AND (3) THE TRAPPED RADIATION BELTS IN THE VICINITY OF JUPITER. ADDITIONALLY, THIS DETECTOR WAS ABLE TO STUDY LOW-ENERGY PARTICLES IN THE INTERPLANETARY MEDIUM. THE ENERGY RANGE OF THIS DETECTOR WAS 10 KEV TO 1.1 MEV FOR ELECTRONS AND 10 KEV TO 150 MEV FOR IONS. DURING THE INTERPLANETARY CRUISE PERIOD, PROTONS, ALPHA PARTICLES, AND HEAVIER NUCLEI (Z FROM 3 TO 26) WERE SEPARATELY IDENTIFIED AND THEIR ENERGY MEASURED IN THE RANGE FROM 0.05 TO 30 MEV, USING A LOW-ENERGY PARTICLE TELESCOPE.

----- VOYAGER 2, LANE -----

INVESTIGATION NAME- MULTIFILTER PHOTOPOLARIMETER,  
2200-7300 Å

NSSDC ID- 77-076A-11

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST  
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.L. LANE	NASA-JPL
CI - K. PANG	SCIENCE APPL. INC.
CI - J.E. HANSEN	NASA-GISS
CI - D.L. COFFEEN	NASA-GISS
CI - L. ESPOSITO	U OF COLORADO
CI - M. SATO	NASA-GISS
CI - R. WEST	U OF COLORADO

NSSDC ID- 77-076A-01

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
PLANETARY ATMOSPHERES  
PLANETOLOGY

PERSONNEL

TL - B.A. SMITH	U OF ARIZONA
DT - L.A. SCODERBLOM	US GEOLOGICAL SURVEY
TM - G.A. BRIGGS	NASA HEADQUARTERS
TM - A.F. COOK	SAO
TM - G.E. DANIELSON	CALIF INST OF TECH
TM - M.E. DAVIES	RAND CORP
TM - G.E. HUNT	U COLLEGE LONDON
TM - T. OWEN	STATE U OF NEW YORK
TM - C. SAGAN	CORNELL U
TM - V.E. SUCI	U OF WISCONSIN
TM - T.V. JOHNSON	NASA-JPL
TM - H. MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF AN E-IN, F/1.1 TELESCOPE THAT SENT ITS OBSERVATIONS THROUGH A POLARIZER AND A FILTER FOR ONE OF EIGHT BANDS IN THE 2200- TO 7300-Å SPECTRAL REGION. THEN ON TO A PHOTOMULTIPLIER TUBE. BY STUDY OF THESE EMISSION INTENSITY DATA, INFORMATION ON SURFACE TEXTURE AND COMPOSITION OF BOTH PLANETS (JUPITER AND SATURN) COULD BE OBTAINED, ALONG WITH INFORMATION OF SIZE DISTRIBUTION AND COMPOSITION OF SATURN'S RINGS AND INFORMATION ON ATMOSPHERIC SCATTERING PROPERTIES AND DENSITY FOR BOTH PLANETS. MOLECULAR SCALE HEIGHTS FOR BOTH PLANETS COULD ALSO BE DETERMINED FROM THESE DATA.

----- VOYAGER 2, NESS -----

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 77-076A-05

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY MAGNETIC FIELD  
PARTICLES AND FIELDS  
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - N.F. NESS	NASA-GSFC
CI - R.P. LEPPING	NASA-GSFC
CI - F.M. NEUBAUER	BRUNSWICK TECH U
CI - K.W. BEHANNON	NASA-GSFC
CI - L.F. BURLAGE	NASA-GSFC
CI - M.H. ACUNA	NASA-GSFC

BRIEF DESCRIPTION

THE PHOTOGRAPHIC EXPERIMENT USED A TWO-CAMERA SYSTEM, BASED ON THE MARINER 10 SYSTEM. THIS SYSTEM INCLUDED ONE NARROW-ANGLE, LONG FOCAL-LENGTH CAMERA AND ONE WIDE-ANGLE, SHORT FOCAL-LENGTH CAMERA. THE MAXIMUM RESOLUTION ACHIEVABLE DEPENDED GREATLY ON THE ACTUAL TRAJECTORY ON THIS MULTI-ENCOUNTER MISSION, BUT WAS AS HIGH AS 0.5 TO 1.0 KM ON THE CLOSEST APPROACHES TO SOME OBJECTS. AT JUPITER AND SATURN, THE RESOLUTION WAS EXPECTED TO BE 20 KM AND 5 KM, RESPECTIVELY. THE OBJECTIVES OF THE EXPERIMENT WERE TO PHOTOGRAPH GLOBAL MOTIONS AND CLOUD DISTRIBUTIONS ON JUPITER AND SATURN; GROSS DYNAMICAL PROPERTIES, ZONAL ROTATION, ORIENTATION OF SPIN AXIS, ZONAL SHEAR, VERTICAL SHEAR, FLOW INSTABILITIES, SPOTS, AND SPECTRUM OF SCALE OF ATMOSPHERIC MOTIONS IN TIME AND SPACE. ADDITIONAL OBJECTIVES INCLUDED THE STUDY OF THE MODE OF RELEASE OF INTERNAL ENERGY FLUX (SEARCH FOR CONVECTION CELLS AND ROLLS), STUDY OF GROWTH, DISSIPATION, MORPHOLOGY, AND VERTICAL STRUCTURE OF CLOUD COMPLEXES, GROSS OPTICAL PROPERTIES, GLOBAL AND LOCALIZED SCATTERING FUNCTION IN THE VISIBLE SPECTRUM, POLARIMETRY, NATURE OF CHROMOPHORES, THEIR STRUCTURE AND DEVELOPMENT, HIGH RESOLUTION OF THE GREAT RED SPOT. THE OBJECTIVES OF THE SATELLITE ENCOUNTERS INCLUDED: GROSS CHARACTERISTICS -- SIZE, SHAPE, ROTATION, SPIN AXIS, CARTOGRAPHY, IMPROVED EPHEMERIDES AND MASSES; (2) GEOLOGY -- MAJOR PHYSIOGRAPHIC PROVINCES, IMPACT AND VOLCANIC FEATURES, LINEMENTS, POLAR CAPS, EROSION PROCESSES, AND LOW- AND HIGH-DENSITY SATELLITE COMPARATIVE STUDIES, DETECTION OF ATMOSPHERES, FROSTS, AND LIMB STRATIFICATION OF AEROSOLS; (3) SURFACE PROPERTIES -- COLORIMETRY, SCATTERING FUNCTION, NATURE OF BRIGHTNESS VARIATION, AND SEARCH FOR NEW SATELLITES. STUDIES OF SATURN'S RINGS ARE TO BE CARRIED OUT. OBJECTIVES INCLUDE: (1) RESOLUTION OF INDIVIDUAL RING COMPONENTS OF CLUMPS OF MATERIAL; (2) VERTICAL AND RADIAL DISTRIBUTION OF MATERIAL OF VERY HIGH RESOLUTIONS; (3) SCATTERING FUNCTION; (4) COARSE POLARIMETRY; (5) OCCULTATION -- OPTICAL DEPTHS; AND (6) DISTINGUISHING DIFFERENT TYPES OF MATERIAL IN THE RINGS. OTHER OBJECTIVES WERE TO SEARCH FOR NEW COMETS, ASTEROIDS, AND TARGETS OF OPPORTUNITY.

----- VOYAGER 2, TYLER -----

INVESTIGATION NAME- RADIO SCIENCE TEAM

NSSDC ID- 77-076A-02

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
CELESTIAL MECHANICS  
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - G.L. TYLER	STANFORD U
TM - G.F. LINDAL	NASA-JPL
TM - G.S. LEVY	NASA-JPL
TM - T.A. CROFT	SRI INTERNATIONAL
TM - V.R. ESHLEMAN	STANFORD U
TM - J.D. ANDERSON	NASA-JPL
TM - G.E. WOOD	NASA-JPL

BRIEF DESCRIPTION

THE RADIO SCIENCE TEAM USED THE TELECOMMUNICATIONS SYSTEMS OF THE VOYAGER SPACECRAFT TO PERFORM THEIR STUDIES. THE SYSTEM WAS A COHERENT S- AND X-BAND DOWNLINK AND S-BAND UPLINK. THE SCIENCE OBJECTIVES OF THE RADIO SCIENCE INVESTIGATION WERE: (1) DETERMINE THE PHYSICAL PROPERTIES OF PLANETARY AND SATELLITE IONOSPHERES AND ATMOSPHERES BY EXAMINING THE PROPAGATION EFFECTS ON A DUAL-FREQUENCY RADIO SIGNAL DURING IMMERSION OF SPACECRAFT OCCULTATION BY THE SUBJECT BODY; (2) DETERMINE PLANETARY AND SATELLITE MASSES, GRAVITY FIELDS AND DENSITIES BY PRECISE TRACKING OF A DUAL-FREQUENCY RADIO SIGNAL FROM THE SPACECRAFT DURING THE ENCOUNTER PERIOD; AND (3) DETERMINE THE AMOUNT AND SIZE DISTRIBUTIONS OF MATERIAL IN SATURN'S RINGS AND THE RING DIMENSIONS BY EXAMINING THE PROPAGATION EFFECTS ON A DUAL-FREQUENCY RADIO SIGNAL THAT PASSES THROUGH EACH RING IN SUCCESSION AND THROUGH THE GAP BETWEEN THE C RING AND SATURN'S SURFACE.

----- VOYAGER 2, SCARF -----

INVESTIGATION NAME- PLASMA WAVE (.01-56 kHz)

NSSDC ID- 77-076A-13

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY IONOSPHERES  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.L. SCARF	TRW SYSTEMS GROUP
CI - D.A. GURNETT	U OF IOWA

BRIEF DESCRIPTION

THIS INVESTIGATION PROVIDED CONTINUOUS, SHEATH-INDEPENDENT MEASUREMENTS OF THE ELECTRON DENSITY PROFILES AT JUPITER AND SATURN. IT ALSO GAVE BASIC INFORMATION ON LOCAL WAVE-PARTICLE INTERACTIONS REQUIRED TO CARRY OUT COMPARATIVE STUDIES OF THE PHYSICS OF THE JUPITER AND SATURN MAGNETOSPHERES. THE INSTRUMENTATION CONSISTED OF A 16-CHANNEL STEP FREQUENCY RECEIVER AND A LOW-FREQUENCY WAVEFORM RECEIVER WITH ASSOCIATED ELECTRONICS. THE FREQUENCY RANGE FOR THIS INSTRUMENT WAS FROM 10 Hz TO 56 kHz. THIS INSTRUMENT SHARED THE 10-M ANTENNAS DEVELOPED FOR THE PLANETARY RADIO ASTRONOMY INVESTIGATION.

----- VOYAGER 2, SMITH -----

INVESTIGATION NAME- IMAGING

ORIGINAL PAGE IS  
ONE SIDE

----- VOYAGER 2: VOGT -----

INVESTIGATION NAME= HIGH- AND MODERATELY LOW-ENERGY  
COSMIC-RAY TELESCOPE

NSSDC ID= 77-076A-08 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.E. VOGT	CALIF INST OF TECH
CI - J.R. JOKIPAA	U OF ARIZONA
CI - S.C. STONE	CALIF INST OF TECH
CI - F.B. McDONALD	NASA-GSFC
CI - J.H. TRAINOR	NASA-GSFC
CI - M.R. WEBBER	U OF NEW HAMPSHIRE
CI - A.W. SCHARDT	NASA-GSFC

BRIEF DESCRIPTION

THIS INVESTIGATION STUDIED THE ORIGIN AND ACCELERATION PROCESS, LIFE HISTORY, AND DYNAMIC CONTRIBUTION OF INTERSTELLAR COSMIC RAYS, THE NUCLEOSYNTHESIS OF ELEMENTS IN COSMIC-RAY SOURCES, THE BEHAVIOR OF COSMIC RAYS IN THE INTERPLANETARY MEDIUM, AND THE TRAPPED PLANETARY ENERGETIC PARTICLE ENVIRONMENT. THE INSTRUMENTATION INCLUDED A HIGH-ENERGY TELESCOPE SYSTEM (NETS) AND A LOW-ENERGY TELESCOPE SYSTEM (LETS). THE NETS COVERED AN ENERGY RANGE BETWEEN 6 AND 500 MEV/NUCLEON FOR NUCLEI RANGING IN ATOMIC NUMBERS FROM 1 THROUGH 30. IN ADDITION ELECTRONS IN THE ENERGY RANGE BETWEEN 3 AND 100 MEV WERE MEASURED BY THIS TELESCOPE AND AN ELECTRON TELESCOPE (ETE). THE LETS MEASURED THE ENERGY AND DETERMINED THE IDENTITY OF NUCLEI FOR ENERGIES BETWEEN .15 AND 30 MEV/NUCLEON AND ATOMIC NUMBERS FROM 1 TO 30. THE INSTRUMENTS ALSO MEASURED THE ANISOTROPIES OF ELECTRONS AND NUCLEI. IN ADDITION, ELECTRONS IN THE ENERGY RANGE BETWEEN 3 AND 100 MEV WERE MEASURED BY AN ELECTRON TELESCOPE (ETE).

----- VOYAGER 2: WARWICK -----

INVESTIGATION NAME= PLANETARY RADIO ASTRONOMY

NSSDC ID= 77-076A-10 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS

PERSONNEL

PI - J.W. WARWICK	RADIOPHYSICS, INC
CI - W.E. BROWN, JR.	NASA-JPL
CI - S. GULKIS	NASA-JPL
CI - C.C. HARVEY	PARIS OBSERVATORY
CI - Y. LEDLANCE	PARIS OBSERVATORY
CI - D.H. STAELIN	MASS INST OF TECH
CI - A. BOISCHOT	PARIS OBSERVATORY
CI - T.D. CARR	U OF FLORIDA
CI - F.T. HADDOCK	U OF MICHIGAN
CI - J.K. ALEXANDER, JR.	NASA-GSFC
CI - R. PHILLIPS	NASA-JPL
CI - R.G. PELTZER	MARTIN-MARIETTA AEROSP
CI - J.B. PEARCE	RADIOPHYSICS, INC
CI - A.C. RIDDELL	U OF COLORADO
CI - M.L. KAISER	NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A SWEEP-FREQUENCY RADIO RECEIVER OPERATING IN BOTH POLARIZATION STATES, BETWEEN 20 KHZ AND 40.5 MHZ. THE SIGNAL WAS RECEIVED BY A PAIR OF ORTHOGONAL 10-M MONPOLE ANTENNAS. THE PHYSICS OF MAGNETOSPHERIC PLASMA RESONANCES AND NONTHERMAL RADIO EMISSIONS FROM THESE PLANETARY REGIONS WAS STUDIED BY INVESTIGATION OF THE RADIO EMISSION SIGNALS FROM JUPITER AND SATURN OVER THIS RANGE OF FREQUENCIES.

**3**

**DESCRIPTIONS OF PLANNED SPACECRAFT  
AND EXPERIMENTS**

### **3. DESCRIPTIONS OF PLANNED SPACECRAFT AND EXPERIMENTS**

This section contains descriptions of spacecraft and experiments pertinent to this report that were planned as of May 31, 1980, had progressed beyond the experiment or investigation selection stage, and for which NSSDC has at least minimal documentation. A few changes subsequent to this date may appear, depending on availability. The descriptions are sorted first by spacecraft common name. Within each spacecraft listing, experiments are ordered by the principal investigator's or team leader's last name. If the common name, as used by NSSDC, is not known, it can be found by referring to an alternate name found in the Index of Active and Planned Spacecraft and Experiments (Section 4).

Each spacecraft or experiment entry in this section is composed of two parts, a heading and brief description. The headings list characteristics of satellites and experiments. Many of the terms used in this section are defined in Appendix C.

#### **3.1 Contents of Spacecraft Entries**

The heading for each spacecraft description in this section includes a set of planned initial orbit parameters: orbit type, orbit period, apoapsis, periapsis, and inclination for the spacecraft. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft weight, launch date (as provided by the project office; actual date may change), site, and vehicle, spacecraft common and alternate names, NSSDC ID code, sponsoring country and agency, and spacecraft personnel codes as follows:

CODE CO (general contact)  
CODE MG (program manager)  
CODE MM (mission manager)  
CODE MS (mission scientist)  
CODE PC (project coordinator)  
CODE PD (project director)  
CODE PE (project engineer)  
CODE PM (project manager)  
CODE PS (project scientist)  
CODE SC (program scientist)  
CODE TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for the missions of other countries or agencies have been given the same position names. The spacecraft brief description is immediately below each heading.

#### **3.2 Contents of Experiment Entries**

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the name and affiliation or location of the principal investigator (PI) or team leader

(TL) for the experiment as well as other investigators (OI), team members (TM), deputy team leader (DT), co-investigator (CI), or general contact (CO) associated with the experiment. The investigators are not listed in any particular order within each experiment. The experiment brief description is immediately below each heading.

The investigative program may include one of the following NASA Headquarters division codes:

CODE EB (Environmental Observations)  
CODE EC (Communications)  
CODE EM (Space Processing)  
CODE ER (Resource Observations)  
CODE RS (Space Systems)  
CODE SB (Life Sciences)  
CODE SC (Astrophysics)  
CODE SL (Planetary)  
CODE ST (Solar Terrestrial)

The addition of /CO-OP to any code indicates a cooperative effort between NASA and another agency.

### 3.3 Planned Spacecraft and Experiment Descriptions

A spacecraft is included in the planned section of this report if it is an approved or a proposed mission where the experiments or investigations have already been selected.

----- ASTRO-A -----

SPACECRAFT COMMON NAME- ASTRO-A  
ALTERNATE NAMES- ASTRONOMICAL SATELLITE-A

NSSDC ID- ASTRO-A

LAUNCH DATE- 02/09/81  
LAUNCH SITE- KAGOSHIMA, JAPAN  
LAUNCH VEHICLE- M-3B

WEIGHT- 180. KG

SPONSORING COUNTRY/AGENCY  
JAPAN ISAS

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 98.2 MIN  
PERIAPSIS- 300. KM ALT

INCLINATION- 31. DEG  
APOAPSIS- 600. KM ALT

PERSONNEL

PI - Y. TANAKA U OF TOKYO  
PI - Z. SUENOTO U OF TOKYO

BRIEF DESCRIPTION

THE MAIN OBJECTIVE OF THE ASTRO-A MISSION IS THE DETAILED STUDY OF SOLAR FLARES DURING THE NEXT SOLAR MAXIMUM PERIOD. PRINCIPAL INVESTIGATIONS ARE: (1) IMAGING OF SOLAR FLARE X-RAYS IN THE RANGE 10-60 KEV BY MEANS OF ROTATING MODULATION COLLIMATORS, AND (2) SPECTROSCOPY OF X-RAY EMISSION LINES FROM HIGHLY IONIZED IRON IN SOLAR FLARES IN THE RANGE 1.5-2.0 Å BY MEANS OF A DRAG SPECTROMETER. WAVE LENGTH SCANNING IS ACHIEVED BY THE SPACECRAFT REVOLUTION WITH AN OFFSET POINTING OF THE SPIN AXIS WITH RESPECT TO THE SUN. INVESTIGATIONS (1) AND (2) EACH HAVE A TIME RESOLUTION OF 6 S. IN ADDITION, THE FOLLOWING INVESTIGATIONS ARE INCLUDED: THREE SOLAR FLARE X-RAY MONITORS THAT RECORD THE TIME PROFILE AND SPECTRUM OF THE X-RAY FLARES IN THE RANGE 2-60 KEV, A SOLAR FLARE GAMMA-RAY DETECTOR FOR THE RANGE 0.4-7.0 KEV, A PARTICLE DETECTOR THAT MONITORS ELECTRON FLUX ABOVE 100 KEV, AND PLASMA PROBES FOR THE MEASUREMENT OF ELECTRON DENSITY AND TEMPERATURE.

----- ASTRO-A, NISHI-----

INVESTIGATION NAME- ELECTRON DENSITY AND TEMPERATURE PLASMA PROBES

NSSDC ID- ASTRO-A-06 INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
SPACE PLASMAS

PERSONNEL

PI - K. HIRAO U OF TOKYO  
PI - M. OYA U OF TOKYO  
OI - K. OGAWA U OF TOKYO  
OI - T. TAKAHASHI U OF TOKYO

BRIEF DESCRIPTION

THIS EXPERIMENT USES PLASMA PROBES TO MEASURE ELECTRON DENSITY AND ELECTRON TEMPERATURE DURING THE SOLAR MAXIMUM PERIOD.

----- ASTRO-A, KONDO-----

INVESTIGATION NAME- SOLAR FLARE GAMMA-RAY DETECTOR IN  
0.4-7.0 KEV RANGE

NSSDC ID- ASTRO-A-04 INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - J. KONDO U OF TOKYO  
PI - K. OKUDAIRA RIKKYO U  
OI - Y. HIRASHIMA RIKKYO U  
OI - M. YOSHIMORI RIKKYO U

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURES GAMMA RAYS FROM SOLAR FLARES IN THE ENERGY RANGE OF 0.4-7.0 KEV.

----- ASTRO-A, MATSUOKA-----

INVESTIGATION NAME- TIME PROFILE AND SPECTRA OF X-RAY FLARES  
IN THE 2-60 KEV RANGE

NSSDC ID- ASTRO-A-03 INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - M. MATSUOKA U OF TOKYO  
OI - K. KOBAYASHI U OF TOKYO  
OI - H. INOUU U OF TOKYO

BRIEF DESCRIPTION

THIS EXPERIMENT USES X-RAY MONITORS TO RECORD TIME PROFILES AND SPECTRUM OF SOLAR X-RAY FLARES IN THE ENERGY RANGE OF 2-60 KEV.

----- ASTRO-A, NISHI-----

INVESTIGATION NAME- SOLAR FLARE X-RAY DRAG SPECTROSCOPY IN  
1.5-2.0 Å RANGE

NSSDC ID- ASTRO-A-02

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - K. NISHI U OF TOKYO  
OI - F. NORIVARA U OF TOKYO  
OI - K. TANAKA U OF TOKYO

BRIEF DESCRIPTION

THIS EXPERIMENT USES A DRAG SPECTROMETER TO STUDY THE SPECTROSCOPY OF X-RAY EMISSION LINES FROM HIGHLY IONIZED IRON IN SOLAR FLARES. THE SPECTRUM COVERED IS IN THE RANGE OF 1.5-2.0 Å. WAVE-LENGTH SCANNING IS ACHIEVED BY SPACECRAFT ROTATION WITH THE SPIN-AXIS OFFSET SLIGHTLY FROM THE SUN. THE TIME RESOLUTION IS 6 S.

----- ASTRO-A, TAKAKURA-----

INVESTIGATION NAME- SOLAR FLARE X-RAYS IN RANGE OF 10-60 KEV  
USING ROTATING COLLIMATOR IMAGING

NSSDC ID- ASTRO-A-01

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - T. TAKAKURA U OF TOKYO  
OI - S. PIYAPOTO OSAKA CITY U  
OI - V. OGAWARA U OF TOKYO  
OI - K. OKI U OF TOKYO  
OI - T. MURAKAMI U OF TOKYO

BRIEF DESCRIPTION

THIS EXPERIMENT USES ROTATING MODULATION COLLIMATORS TO IMAGE SOLAR FLARE X-RAYS IN THE ENERGY RANGE OF 10 TO 60 KEV. THE TIME RESOLUTION IS 6 S.

----- ASTRO-A, TAKEUCHI-----

INVESTIGATION NAME- ELECTRON FLUX ABOVE 100 KEV PARTICLE DETECTOR MONITOR

NSSDC ID- ASTRO-A-05

INVESTIGATIVE PROGRAM  
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - H. TAKEUCHI INST PHYS + CHEM RES  
OI - T. ISAI INST PHYS + CHEM RES

BRIEF DESCRIPTION

THIS EXPERIMENT USES A PARTICLE DETECTOR TO MONITOR SOLAR ELECTRON FLUX ABOVE 100 KEV.

----- CCC-----

SPACECRAFT COMMON NAME- CCC  
ALTERNATE NAMES- AMPTE/CHARGE COMP EXPL, CHARGE COMPOSITION EXP

NSSDC ID- CCC

LAUNCH DATE- 09/13/83  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 98. MIN  
PERIAPSIS- 300. KM ALT

INCLINATION- 2. DEG  
APOAPSIS- 51000. KM ALT

**PERSONNEL**

PI - P.V. GASTANO  
 PI - E.R. SCHREIBLING  
 PR - G.W. OUSLEY  
 PS - M.M. ACUNA

NASA HEADQUARTERS  
 NASA-GSFC  
 NASA-GSFC

**BRIEF DESCRIPTION**

THE PURPOSES OF THIS MISSION ARE TO STUDY THE ACCESS OF SOLAR WIND IONS TO THE MAGNETOSPHERE AND THE CONVECTIVE-DIFFUSIVE TRANSPORT AND ENERGIZATION OF THESE MAGNETOSPHERIC PARTICLES. THE PROGRAM CONSISTS OF THIS SPACECRAFT AND THE IAN SPACECRAFT USED TO PROVIDE MULTIPLE ION RELEASES, WHICH WILL BE DETECTED BY INSTRUMENTS ON THE CEE. THE SPACECRAFT IS POWERED BY FOUR SOLAR CELL PANELS THAT PROVIDE 140 W, AND HAS A BATTERY. THE SPACECRAFT IS SPIN STABILIZED AT 10 RPM WITH THE SPIN AXIS IN THE DROPOUT PLANE. THE ATTITUDE SYSTEM CONSISTS OF A SUN SENSOR AND A 3-AXIS MAGNETOMETER. THE THERMAL CONTROL IS PASSIVE. THE TELEMETRY SYSTEM IS A 1-W, S-BAND TRANSMITTER WITH TWO OPPositely POLARIZED ANTENNAS. THE VECTOR MAGNETOMETER IS ALSO USED TO DETERMINE THE PITCH ANGLES OF THE PARTICLES MEASURED BY THE THREE INSTRUMENTS, WHICH ARE PROVIDED BY THE INVESTIGATORS. THE SCIENTIFIC TEAM IS LISTED IN APPENDIX B.

----- CCE, GLOECKLER -----

**INVESTIGATION NAME- CHARGE-ENERGY-MASS SPECTROMETER (CERM)**

NSSDC ID- CCE -03

INVESTIGATIVE PROGRAM  
 CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**

SPACE PLASMAS  
 MAGNETOSPHERIC PHYSICS  
 PARTICLES AND FIELDS

**PERSONNEL**

PI - G. GLOECKLER  
 PI - D.K. HOVESTADT  
 PI - G. PASCHMANN  
 PI - D. WILKEN  
 PI - W.L. AXFORD

U OF MARYLAND  
 MPI-ESTRATERR PHYSE  
 MPI-ESTRATERR PHYSE  
 MPI-AERONOMY  
 MPI-AERONOMY

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTS OF AN ENTRANCE COLLIMATOR AND AN ELECTROSTATIC ANALYZER SECTION, FOLLOWED BY A TIME-OF-FLIGHT AND TOTAL ENERGY MEASUREMENT SECTION. THE ENERGY RANGE COVERED IS FROM 2 TO 200 KEV/E WITH A GEOMETRIC FACTOR OF 2.E-03 CM<sup>2</sup>-SR. ENERGY RESOLUTION IS 9 TO 18 PERCENT, AND ALL CHARGE STATES AND ISOTOPES OF H AND HE, Li WITH ITS CHARGE STATES, AND MAJOR ELEMENTS AND CHARGE STATES UP TO AND INCLUDING Fe ARE RESOLVED.

----- CCE, MCENTIRE -----

**INVESTIGATION NAME- MEDIUM ENERGY PARTICLE ANALYZER (MEPA)**

NSSDC ID- CCE -02

INVESTIGATIVE PROGRAM  
 CODE ST

**INVESTIGATION DISCIPLINE(S)**

PARTICLES AND FIELDS  
 MAGNETOSPHERIC PHYSICS  
 SPACE PLASMAS

**PERSONNEL**

PI - R.W. MCENTIRE  
 PI - S.M. KRIMIGIS

APPLIED PHYSICS LAB  
 APPLIED PHYSICS LAB

**BRIEF DESCRIPTION**

THIS INSTRUMENT HAS THE CAPABILITY OF RELIABLY MEASURING VERY SMALL FLUXES OF LITHIUM TRACER IONS OVER A WIDE ENERGY RANGE IN THE PRESENCE OF THE INTENSE BACKGROUND OF PROTONS, ALPHA PARTICLES AND ELECTRONS, WHILE MAINTAINING AS LARGE A GEOMETRY FACTOR AND AS LOW AN ENERGY THRESHOLD AS POSSIBLE. IN ADDITION, IT HAS THE CAPABILITY OF MONITORING THE NATURAL TRACER IONS (Z GREATER THAN OR EQUAL TO 2 NUCLEI) WITH CHARGE, ENERGY, PITCH ANGLE AND TEMPORAL RESOLUTION. THE INSTRUMENT CONSISTS OF A THIN FOIL SOLID STATE DETECTOR TELESCOPE WITH A VERY THIN FRONT ELEMENT AND A 10 CM SEPARATION BETWEEN THE FRONT AND REAR DETECTORS. PARTICLE TIME OF FLIGHT (TOF) IS MEASURED BETWEEN THE FRONT AND REAR DETECTORS, AND RESIDUAL PARTICLE ENERGY IS MEASURED IN THE REAR DETECTOR. TWO PARAMETER ANALYSIS (TOF AND ENERGY) IS PERFORMED ON PARTICLES PENETRATING THE FRONT DETECTOR, PROVIDING PRECISE CHARGE RESOLUTION WITH UNPRECEDENTED IMMUNITY TO ACCIDENTAL EVENTS OVER AN ENERGY RANGE (FOR Z FROM 1 TO 16) FROM APPROXIMATELY 0.06 TO 20 MEV/N.

----- CCE, SHELLEY -----

**INVESTIGATION NAME- PLASMA COMPOSITION**

NSSDC ID- CCE -03

INVESTIGATIVE PROGRAM  
 CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**

SPACE PLASMAS  
 MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - E.B. SHELLEY  
 PI - R.D. SHARP  
 PI - G. HAERENDEL  
 PI - M.R. ROBBENBAUER  
 PI - R.G. JOHNSON  
 PI - P.E. EBERNARDT  
 PI - M. DALISIKA  
 PI - J.L. GEISS  
 PI - D.T. YOUNG  
 PI - A. SHIELMETTI

LOCKHEED PALO ALTO  
 LOCKHEED PALO ALTO  
 MPI-ESTRATERR PHYSE  
 MPI-AERONOMY  
 LOCKHEED PALO ALTO  
 U OF BERNE  
 U OF BERNE

**BRIEF DESCRIPTION**

THE INSTRUMENT CONSISTS OF AN ENTRANCE COLLIMATOR AND RETARDING POTENTIAL ANALYZER, A CURVED-PLATE ELECTROSTATIC ENERGY ANALYZER, AND A COMBINED ELECTROSTATIC-MAGNETIC MASS ANALYZER IN SERIES. THE ENERGY RANGE COVERED IS 0.05 TO 17 KEV/E WITH A GEOMETRIC FACTOR RANGING FROM 1 TO 5 E-02 CM<sup>2</sup>-SR. AN ENERGY RESOLUTION FROM 9 TO 18 PERCENT, AND A MASS/0 RESOLUTION OF 10 PERCENT. THIS INSTRUMENT CLEARLY SEPARATES LI+ AND DAY TRACER IONS FROM THE BACKGROUND. IT IS NEARLY IDENTICAL TO THE ONE FLOWN ON ISEE 1 BY THE SAME GROUP OF INVESTIGATORS, AND TO THE ONE DEVELOPED FOR THE DYNAMICS EXPLORER SPACECRAFT.

----- CCE, SHELLEY -----

**SPACECRAFT COMMON NAME- CODE**  
**ALTERNATE NAMES- COSMIC BACKGROUND EXPL**

NSSDC ID- CODE

LAUNCH DATE- 10/01/85  
 LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
 LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
 UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS  
 ORBIT TYPE- GEOCENTRIC  
 ORBIT PERIOD- 103. MIN  
 PERIASTRA- 900. KM ALT      INCLINATION- 99. DEG  
 APARASIS- 900. KM ALT

PERSONNEL  
 PI - J.D. ROSENDHAL  
 PI - L.J. BONDY  
 SC - M.W. BOGESS  
 PR - G.W. LONGNECKER  
 PS - J.C. MATHER

NASA HEADQUARTERS  
 NASA HEADQUARTERS  
 NASA HEADQUARTERS  
 NASA-GSFC  
 NASA-GSFC

**BRIEF DESCRIPTION**

THE PURPOSE OF THE CODE MISSION IS TO TAKE PRECISE MEASUREMENTS OF THE DIFFUSE RADIATION BETWEEN 1 MICRORAM AND 13 MM OVER THE WHOLE CELESTIAL SPHERE. THE FOLLOWING QUANTITIES ARE MEASURED: (1) THE SPECTRUM OF THE 3 K RADIATION OVER THE RANGE 0.1 TO 10 MM, (2) THE ISOTROPY OF THIS RADIATION FROM 3.3 TO 13 MM, AND (3) THE SPECTRUM AND ANGULAR DISTRIBUTION FROM 1 TO 300 MICRORAM. THE SPACECRAFT CONSISTS OF A 3000-KG BASE MODULE TO WHICH A 600-KG EXPERIMENT MODULE IS ATTACHED. THE EXPERIMENT MODULE CONTAINS A LIQUID HE DOWAN FILLED WITH 70 KG OF 2 K SUPERFLUID, WITH A CONICAL SUN SHADE/GROUND PLANE. THE TWO MODULES ROTATE AT ONE RPM ABOUT THE AXIS OF SYMMETRY; THE ORIENTATION OF THE SPIN AXIS IS MAINTAINED ANGLED-EARTH AND AT 90 DEG TO THE SUN/ EARTH LINE. THE SPACECRAFT IS A 12-SIDED POLYHEDRON THAT HAS SOLAR PANELS ON EACH SIDE TO SUPPLY AN ORBIT-AVERAGED POWER OF 600 W. THE COMMUNICATIONS AND DATA HANDLING SYSTEM PROVIDES FOR CONTROL OF ALL SPACECRAFT AND EXPERIMENT FUNCTIONS. A NASA STANDARD TDRS TRANSPONDER IS USED FOR COMMAND, TELEMETRY, AND TRACKING. TRANSMISSION OF DATA IS THROUGH A BODY-MOUNTED S-BAND PHASED-ARRAY ANTENNA DEPLOYED ALONG THE SPIN AXIS, EITHER IN REAL TIME OR FROM A TAPE RECORDER. THE SPACECRAFT ALSO HOUSES A PROPULSION SYSTEM THAT BOOSTS IT FROM ITS 300-MM ALTITUDE SHUTTLE PARKING ORBIT TO THE 900-MM ALTITUDE OPERATIONAL VALUE. THE OPERATIONAL ORBIT IS A DAWN-DUSK SUN-SYNCHRONOUS ONE SO THAT THE SUN IS ALWAYS TO THE SIDE AND CAN BE SHIELDED FROM THE INSTRUMENTS. WITH THIS ORBIT AND THE SPIN AXIS ORIENTATION, THE INSTRUMENTS PERFORM A COMPLETE SCAN OF THE CELESTIAL SPHERE EVERY 6 MONTHS OR TWICE DURING THE 3-YR LIFETIME OF THE LIQUID HE. THE SPIN AND SYMMETRICAL CONFIGURATION ELIMINATE LOCAL THERMAL EFFECTS THAT COULD BIAS THE DATA. LOW-CONDUCTANCE SUPPORTS AND MULTILAYERED INSULATION ARE USED TO DECOPPLE THE SPACECRAFT AND EXPERIMENT MODULES.

----- CODE, HAUSER -----

**INVESTIGATION NAME- DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIBRE)**

NSSDC ID- CODE -02

INVESTIGATIVE PROGRAM  
 CODE SC

**INVESTIGATION DISCIPLINE(S)**  
**ASTROPHYS**

**PERSONNEL**

PI - R.G. HAUSER	NASA-GSFC
OI - J.C. MATHER	NASA-GSFC
OI - D.T. WILKINSON	PRINCETON U
OI - S. GULKIS	NASA-JPL
OI - R. WEISS	MASS INST OF TECH
OI - G.F. SHOOT	LAWRENCE BERKELEY LAB

**BRIEF DESCRIPTION**

THE DIFFUSE IR BACKGROUND EXPERIMENT (DIRBE) CONSISTS OF A CRYOGENICALLY COOLED (TO 2 K) MULTIBAND RADIOMETER USED TO INVESTIGATE DIFFUSE INFRARED RADIATION FROM 1 TO 300 MICRONEETERS. THE INSTRUMENT MEASURES THE ABSOLUTE FLUX IN 10 WAVELENGTH BANDS WITH A 1-DEG FIELD OF VIEW POINTED 30 DEG OFF THE SPIN AXIS. DETECTORS (PHOTOCONDUCTORS) AND FILTERS FOR THE 8-120 MICRONEETER CHANNELS ARE THE SAME AS FOR THE IRAS MISSION. DOLMETERS ARE USED FOR THE LONGEST WAVELENGTH CHANNEL. SENSITIVITY OF THE DEVICE IS 1.E-19 W/SQ CM-SR MICRONEETER-SQ ROOT Hz AT 300 MICRONEETERS, RISING TO 5.E-19 W/SQ CM-SR MICRONEETER-SQ ROOT Hz AT 8 MICRONEETERS. THE TELESCOPE IS WELL BAFFLED TO PREVENT STRAY LIGHT FROM ENTERING THE INSTRUMENT.

\*\*\*\*\* CODE: MATHER\*\*\*\*\*

**INVESTIGATION NAME-** FAR INFRARED ABSOLUTE SPECTROPHOTOMETER (FIRAS)

**NSSDC ID-** CODE -01      **INVESTIGATIVE PROGRAM**  
CODE SC

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY

**PERSONNEL**

PI - J.C. MATHER	NASA-GSFC
OI - R. WEISS	MASS INST OF TECH
OI - R.G. HAUSER	NASA-GSFC
OI - D.T. WILKINSON	PRINCETON U
OI - G.F. SHOOT	LAWRENCE BERKELEY LAB
OI - S. GULKIS	NASA-JPL

**BRIEF DESCRIPTION**

THE FAR IR ABSOLUTE SPECTROPHOTOMETER (FIRAS) IS A CRYOGENICALLY COOLED POLARIZING MICHELSON INTERFEROMETER USED AS A FOURIER TRANSFORM SPECTROMETER. THE INSTRUMENT POINTS ALONG THE SPIN AXIS AND HAS A 7-DEG FIELD OF VIEW. THIS DEVICE MEASURES THE SPECTRUM TO A PRECISION OF 1/1000 OF THE PEAK FLUX AT 1.67 MM FOR EACH 7-DEG FIELD OF VIEW ON THE SKY (OVER THE RANGE 0.1 TO 10 MM). THE FIRAS USES A SPECIAL FLARED TRUMPET HORN FLUX COLLECTOR HAVING VERY LOW SIDELOBE LEVELS, AN EXTERNAL CALIBRATOR COVERING THE ENTIRE BAND, AND REQUIRES PRECISE TEMPERATURE REGULATION AND CALIBRATION. THE INSTRUMENT HAS A DIFFERENTIAL INPUT TO COMPARE THE SKY WITH AN INTERNAL REFERENCE AT 3 K. THIS FEATURE PROVIDES IMMUNITY FROM SYSTEMATIC ERRORS IN THE SPECTROMETER AND CONTRIBUTES SIGNIFICANTLY TO THE ABILITY TO DETECT SMALL DEVIATIONS FROM A BLACKBODY SPECTRUM. THE INSTRUMENT WEIGHS 40 KG, USES 18 W, AND HAS A DATA RATE OF 1000 BPS.

\*\*\*\*\* CODE: SHOOT\*\*\*\*\*

**INVESTIGATION NAME-** DIFFERENTIAL MICROWAVE RADIOMETERS (DMR)

**NSSDC ID-** CODE -03      **INVESTIGATIVE PROGRAM**  
CODE SC

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY

**PERSONNEL**

PI - G.F. SHOOT	LAWRENCE BERKELEY LAB
OI - S. GULKIS	NASA-JPL
OI - D.T. WILKINSON	PRINCETON U
OI - J.C. MATHER	NASA-GSFC
OI - R.G. HAUSER	NASA-GSFC
OI - R. WEISS	MASS INST OF TECH

**BRIEF DESCRIPTION**

THE DIFFERENTIAL MICROWAVE RADIOMETER (DMR) INVESTIGATION USES FOUR DIFFERENTIAL RADIOMETERS TO MAP THE SKY AT 23.5, 31.0, 53, AND 90 GHZ. THE RADIOMETERS ARE DISTRIBUTED AROUND THE OUTER SURFACE OF THE CRYOSTAT. EACH RADIOMETER EMPLOYS A PAIR OF HORN ANTENNAS VIEWING AT 30 DEG FROM THE SPIN AXIS OF THE SPACECRAFT, MEASURING THE DIFFERENTIAL TEMPERATURE BETWEEN POINTS IN THE SKY SEPARATED BY 60 DEG. AT EACH FREQUENCY THERE ARE TWO CHANNELS FOR DUAL POLARIZATION MEASUREMENTS, FOR IMPROVED SENSITIVITY, AND FOR RELIABILITY. EACH RADIOMETER IS A MICROWAVE RECEIVER, WHOSE INPUT IS SWITCHED RAPIDLY BETWEEN THE TWO HORN ANTENNAS, OBTAINING THE DIFFERENCE IN BRIGHTNESS OF TWO FIELDS OF VIEW 7 DEG IN DIAMETER LOCATED 60 DEG APART AND 30 DEG FROM THE AXIS OF THE SPACECRAFT. HIGH SENSITIVITY IS ACHIEVED BY TEMPERATURE STABILIZATION (AT 300 DEG K), BY SPACECRAFT SPIN, AND BY THE ABILITY TO INTEGRATE OVER THE ENTIRE YEAR. SENSITIVITY TO LARGE-SCALE ANISOTROPIES IS ABOUT 3.E-5 DEG K.

\*\*\*\*\* DMSP SD-1/F5\*\*\*\*\*

**SPACECRAFT COMMON NAME-** DMSP SD-1/F5  
**ALTERNATE NAMES-** DMSP BLOCK SD-1, DMSP/F5  
DMSP-F5

**NSSDC ID-** DMSP-F5

**LAUNCH DATE-** 1972-07-10  
**LAUNCH SITE-** VANDENBERG AFB, UNITED STATES  
**LAUNCH VEHICLE-** THOR

**WEIGHT-** 450. KG

**SPONSORING COUNTRY/AGENCY**  
UNITED STATES      **BOE-USAF**

**PLANNED ORBIT PARAMETERS**  
**ORBIT TYPE-** GEOCENTRIC  
**ORBIT PERIOD-** 96 MIN  
**PERIASTRIS-** 650 KM ALT      **INCLINATION-** 98 DEG  
**APOASTRIS-** 650 KM ALT

**PERSONNEL**  
PI - R.G. PTER      **USAF SPACE DIVISION**

**BRIEF DESCRIPTION**

DMSP SD-1/F5 IS ONE OF A SERIES OF METEOROLOGICAL SATELLITES DEVELOPED AND OPERATED BY THE AIR FORCE UNDER THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP). THIS PROGRAM, PREVIOUSLY KNOWN AS DAPP (DATA ACQUISITION AND PROCESSING PROGRAM), WAS CLASSIFIED UNTIL MARCH 1973. THE OBJECTIVES OF THIS PROGRAM ARE TO PROVIDE GLOBAL VISUAL AND INFRARED CLOUD COVER DATA AND SPECIALIZED ENVIRONMENTAL DATA TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS. OPERATIONALLY, THE PROGRAM CONSISTS OF TWO SATELLITES IN 820-KM SUB-SYNCHRONOUS POLAR ORBITS, WITH THE ASCENDING NODE OF ONE SATELLITE IN EARLY MORNING AND THE OTHER AT LOCAL NOON. THE 5.0-M LONG SPACECRAFT IS SEPARATED INTO FOUR SECTIONS -- (1) A PRECISION MOUNTING PLATFORM (PPD) FOR SENSORS AND EQUIPMENT REQUIRING PRECISE ALIGNMENT, (2) AN EQUIPMENT SUPPORT MODULE (ESM) CONTAINING THE ELECTRONICS, REACTION WHEELS, AND SOME METEOROLOGICAL SENSORS, (3) A REACTION CONTROL EQUIPMENT (RCE) SUPPORT STRUCTURE THAT HAS THE THIRD-STAGE MOTOR, HYDRAZINE REACTION CONTROL SYSTEMS THAT SUPPORTS (4) A 9.2-M SOLAR CELL PANEL. THE SPACECRAFT STABILIZATION IS CONTROLLED BY A COMBINATION FLYWHEEL AND MAGNETIC CONTROL COIL SYSTEM SO SENSORS ARE MAINTAINED IN THE DESIRED "EARTH-LOOKING" MODE. ONE FEATURE IS THE PRECISION-POINTING ACCURACY OF THE PRIMARY IMAGER TO 0.01 DEG PROVIDED BY A STAR SENSOR AND UPDATED EPHEMERIS NAVIGATION SYSTEM. THIS ALLOWS AUTOMATIC GEOGRAPHICAL MAPPING OF THE DIGITAL IMAGERY TO THE NEAREST PICTURE ELEMENT. THE OPERATIONAL LINE SCAN SYSTEM (OLS) BUILT BY WESTINGHOUSE, IS THE PRIMARY DATA ACQUISITION SYSTEM THAT PROVIDES REAL-TIME OR STORED, MULTI-ORBIT, DAY-AND-NIGHT VISUAL AND INFRARED IMAGERY AT 0.99 KM (1/3 NAUTICAL MILE) RESOLUTION FOR ALL MAJOR LAND MASSES, 2.7 KM (1-1/2 NAUTICAL MILE) RESOLUTION FOR COMPLETE GLOBAL COVERAGE, AND PROVIDES WITH THIS DATA CALIBRATION, TIMING, AND OTHER AUXILIARY SIGNALS TO THE SPACECRAFT FOR DIGITAL TRANSMISSION TO THE GROUND. A SUPPLEMENTARY SENSOR PACKAGE, THE SPECIAL SENSOR M (SSM), A STEP-SCANNING RADIOMETER, IS THE INFRARED TEMPERATURE-HUMIDITY-OZONE SOUNDER. THE DATA PROCESSING SYSTEM, WHICH INCLUDES THREE HIGH-DENSITY TAPE RECORDERS, IS CAPABLE OF STORING A TOTAL OF 400 KB OF DATA, EACH ALLOWING FULL GLOBAL COVERAGE TWICE DAILY. EITHER RECORDED OR REAL-TIME DATA ARE TRANSMITTED TO GROUND-RECEIVING SITES BY TWO REDUNDANT S-BAND TRANSMITTERS. RECORDED DATA ARE READ OUT TO TRACKING SITES LOCATED AT FAIRCHILD AFB, WA, AND LORING AFB, ME, AND RELATED BY SATCOM TO AIR FORCE GLOBAL WEATHER CENTRAL, OFFUTT AFB, NE. REAL-TIME DATA ARE READ OUT AT MOBILE TACTICAL SITES LOCATED AROUND THE WORLD. A MORE COMPLETE DESCRIPTION OF THE SATELLITE CAN BE FOUND IN THE REPORT, "THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM," D. A. NICHOLS, OPTICAL ENGINEERING, 345 47 JULY - AUGUST 1975.

\*\*\*\*\* DMSP SD-1/F5, AFGLC STAFF\*\*\*\*\*

**INVESTIGATION NAME-** OPERATIONAL LINESCAN SYSTEM (OLS)

**NSSDC ID-** DMSP-F5-01      **INVESTIGATIVE PROGRAM**  
OPERATIONAL METEOROLOGICAL SVS

**INVESTIGATION DISCIPLINE(S)**  
METEOROLOGY

**PERSONNEL**  
PI - AFGLC STAFF      **GLOBAL WEATHER CTR**

**BRIEF DESCRIPTION**

THE OPERATIONAL LINESCAN SYSTEM (OLS) IS THE PRIMARY EXPERIMENT ON THE DMSP-F5 SPACECRAFT. THE PURPOSE OF THIS EXPERIMENT IS TO PROVIDE GLOBAL, DAY/NIGHT OBSERVATIONS OF CLOUD COVER AND CLOUD TEMPERATURE MEASUREMENTS TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS FOR OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE OLS EMPLOYS A SCANNING OPTICAL TELESCOPE DRIVEN IN AN OSCILLATING MOTION, WITH OPTICAL COMPENSATION FOR IMAGE MOTION, WHICH RESULTS IN NEAR-CONSTANT RESOLUTION THROUGHOUT THE SENSOR FIELD OF VIEW. THE RADIOMETER OPERATES IN TWO ("LIGHT" AND "THERMAL") SPECTRAL INTERVALS -- (1) VISIBLE AND NEAR INFRARED (0.4 TO 1.1 MICRONEETERS) AND (2) INFRARED (8 TO 13 MICRONEETERS). THE RADIOMETER PRODUCES, WITH ONBOARD PROCESSING, DATA IN FOUR MODES -- LF (LIGHT FINED) AND TF (THERMAL FINED) DATA WITH A RESOLUTION OF .56 KM AND LS (LIGHT SMOOTHED) AND TS (THERMAL SMOOTHED) DATA WITH A RESOLUTION OF 2.8 KM. EACH OF THREE ONBOARD RECORDERS HAS A STORAGE CAPABILITY OF 400 KBW OF BOTH LS AND TS DATA OR 70 KBW OF LF AND TF DATA. FOR DIRECT REBOUT TO TACTICAL SITES, THE EXPERIMENT IS PROGRAMMED SO THAT LF AND TS DATA ARE OBTAINED AT NIGHT. THE INFRARED DATA (TF AND TS) COVERS A TEMPERATURE RANGE OF 210 TO 310 DEG K WITH AN ACCURACY OF 1 DEG C. THE LS DATA MODE PROVIDES VISUAL DATA THROUGH A DYNAMIC RANGE FROM FULL SUNLIGHT DOWN TO A QUARTER MOON. THIS MODE ALSO AUTOMATICALLY ADJUSTS THE GAIN ALONG SEAM TO ALLOW USEFUL DATA

TO BE OBTAINED ACROSS THE TERMINATOR. ADDITIONAL INFORMATION ON THIS EXPERIMENT IS CONTAINED IN THE REPORT, 'PRIMARY OPTICAL SUBSYSTEMS FOR DMSP', D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, JULY - AUGUST 1975.

----- DMSP 5D-1/F5, AFGMC STAFF-----

INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER  
SPECIAL SENSOR H (SSH)

NSSDC ID- DMSP-F5-02 INVESTIGATIVE PROGRAM  
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - AFGMC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION

SPECIAL SENSOR H (SSH) IS A VERTICAL TEMPERATURE PROFILE RADIOMETER (VTPR). THE OBJECTIVE OF THIS EXPERIMENT IS TO OBTAIN VERTICAL TEMPERATURE, WATER VAPOR, AND OZONE PROFILES OF THE ATMOSPHERE TO SUPPORT DEPARTMENT OF DEFENSE REQUIREMENTS IN OPERATIONAL WEATHER ANALYSIS AND FORECASTING. THE SSH IS A 16-CHANNEL SENSOR WITH ONE CHANNEL (1022 CM<sup>-1</sup>) IN THE 10-MICROMETER OZONE ABSORPTION BAND, ONE CHANNEL (835 CM<sup>-1</sup>) IN THE 12-MICROMETER ATMOSPHERIC WINDOW, SIX CHANNELS (767, 725, 708, 695, 676, 668.5 CM<sup>-1</sup>) IN THE 15-MICROMETER CO<sub>2</sub> ABSORPTION BAND, AND EIGHT CHANNELS (535, 488.5, 441.5, 420, 374, 397.5, 358, 353.5 CM<sup>-1</sup>) IN THE 22- TO 30-MICROMETER ROTATIONAL WATER VAPOR ABSORPTION BAND. THE EXPERIMENT CONSISTS OF AN OPTICAL SYSTEM, DETECTOR AND ASSOCIATED ELECTRONICS, AND A SCANNING MIRROR. THE SCANNING MIRROR IS STEPPED ACROSS THE SATELLITE SUBTRACK, ALLOWING THE SSH TO VIEW 25 SEPARATE COLUMNS OF THE ATMOSPHERE EVERY 32 S OVER A CROSS TRACK GROUND SWATH OF 2000 KM. WHILE THE SCANNING MIRROR IS STOPPED AT A SCENE STATION, THE CHANNEL FILTERS ARE SEQUENCED THROUGH THE FIELD OF VIEW. THE SURFACE RESOLUTION IS APPROXIMATELY 30 KM AT nadir. THE RADIANCE DATA ARE TRANSFORMED INTO TEMPERATURE, WATER VAPOR AND OZONE PROFILES BY A MATHEMATICAL INVERSION TECHNIQUE. A MORE COMPLETE DESCRIPTION OF THE EXPERIMENT CAN BE FOUND IN THE REPORT, 'DMSP SPECIAL METEOROLOGICAL SENSOR H, OPTICAL SUBSYSTEM', D. A. NICHOLS, OPTICAL ENGINEERING, 14, NO. 4, 284-288, JULY-AUGUST 1975.

----- DMSP 5D-1/F5, ROTHWELL-----

INVESTIGATION NAME- PRECIPITATING ELECTRON SPECTROMETER

NSSDC ID- DMSP-F5-03 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
AERONOMY

PERSONNEL  
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE SPECTROMETER CONSISTS OF TWO DIFFERENT-SIZED CYLINDRICAL ELECTROSTATIC ANALYZERS (ESA) USING CHANNELTRON ELECTRON MULTIPLIERS. THE ESA'S POINT TOWARD THE ZENITH IN ORDER TO MEASURE PRECIPITATING ELECTRONS. THE LARGE ESA HAS A FIELD OF VIEW (FOV) OF 1.6 BY 8.0 DEG WITH A DELTA E/E OF 0.04, WHILE THE SMALL ONE HAS A FOV OF 3.7 BY 4.8 DEG WITH A DELTA E/E OF 0.072. THE LARGE ESA COVERS THE RANGE FROM 1 TO 20 KEV AND THE OTHER ONE FROM 50 TO 1000 EV. A COMPLETE EIGHT-POINT SPECTRUM FROM EACH UNIT IS OBTAINED IN 1 S.

----- DMSP 5D-1/F5, SAGALYN-----

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR

NSSDC ID- DMSP-F5-05 INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
AERONOMY  
PARTICLES AND FIELDS

PERSONNEL  
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF ONE SPHERICAL (SEA) AND ONE PLANAR (PEA) ELECTROSTATIC ANALYZER. THE SEA PROVIDES MEASUREMENTS OF ELECTRON DENSITIES FROM 10 TO 1.6E/CU CM IN THE TEMPERATURE RANGE FROM 200 TO 15,000 DEG K. THE PEA MEASURES ION TEMPERATURES IN THE SAME RANGE AS WELL AS THE AVERAGE ION MASS OVER THE RANGE 1 TO 35 U. THE PEA IS ORIENTED IN THE DIRECTION OF THE POSITIVE SPACECRAFT VELOCITY VECTOR, WHILE THE SEA IS ORIENTED AT RIGHT ANGLES TO THIS DIRECTION AND AWAY FROM THE SUN TO MINIMIZE THE EFFECT OF PHOTOELECTRONS. THE DEVICE ALSO PROVIDES A MEASUREMENT OF THE SPACECRAFT POTENTIAL.

----- DMSP 5D-1/F5, SNYDER-----

INVESTIGATION NAME- PASSIVE IONOSPHERIC MONITOR

NSSDC ID- DMSP-F5-06

INVESTIGATIVE PROGRAM  
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES

PERSONNEL

PI - A.L. SNYDER

USAF GEOPHYS LAB

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF A HIGH-FREQUENCY RADIO RECEIVER CONNECTED TO A SHORT ANTENNA THAT SWEEPS FROM 1.3 TO 13.9 MHZ IN 100-KHZ STEPS. THE DEVICE IS USED TO MONITOR THE IONOSPHERIC BREAKTHROUGH FREQUENCY OF NOISE GENERATED BY MAN-MADE OR NATURAL SOURCES BELOW THE F2 LAYER TO OBTAIN THE CRITICAL FREQUENCY OF THIS LAYER (F0F2). THE F0F2 PARAMETER IS USED IN CONSTRUCTING ELECTRON-DENSITY PROFILES USED IN FORECASTING THE STATE OF THE IONOSPHERE. THE INSTRUMENT CAN DETECT ELECTRIC FIELDS DOWN TO 10 MICROVOLTS/M.

\*\*\*\*\* DYNAMICS EXPLORER-A\*\*\*\*\*

SPACECRAFT COMMON NAME- DYNAMICS EXPLORER-A  
ALTERNATE NAMES- DE-A

NSSDC ID- DE-A

LAUNCH DATE- 07/31/81

WEIGHT- 283. KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 440. MIN  
PERIASTRIS- 675. KM ALT

INCLINATION- 90.0 DEG  
APOAPSIS- 24875. KM ALT

PERSONNEL

RG - M.B. WEINREB  
SC - E.R. SCHMIDLING  
PM - G.D. HOGAN  
PS - R.A. HOFFMAN

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE GENERAL OBJECTIVE OF THE DYNAMICS EXPLORER (DE) MISSION IS TO INVESTIGATE THE STRONG INTERACTIVE PROCESSES COUPLING THE HOT, TENUEOUS, CONVECTING PLASMAS OF THE MAGNETOSPHERE AND THE COOLER, DENSER PLASMAS AND GASES COROTATING IN THE EARTH'S IONOSPHERE, UPPER ATMOSPHERE, AND PLASMAPAUSE. TWO SATELLITES, LAUNCHED TOGETHER, DE-A AND -B, ARE PLACED IN POLAR COPLANAR ORBITS TO PERMIT SIMULTANEOUS MEASUREMENTS AT HIGH AND LOW ALTITUDES ON THE SAME FIELD LINES. THE DE-A SPACECRAFT (HIGH ALTITUDE MISSION) USES AN ELLIPTICAL ORBIT SELECTED TO ALLOW: (1) MEASUREMENTS EXTENDING FROM THE HOT MAGNETOSPHERIC PLASMA THROUGH THE PLASMAPAUSE TO THE COOL IONOSPHERE; (2) GLOBAL AURORAL IMAGING, WAVE MEASUREMENTS IN THE HEART OF THE MAGNETOSPHERE, AND CROSSING OF AURORAL FIELD LINES AT SEVERAL EARTH RADII; AND (3) MEASUREMENTS FOR SIGNIFICANT PERIODS ALONG A MAGNETIC FIELD FLUX TUBE. THE SPACECRAFT APPROXIMATES A SHORT RIGHT CYLINDER 137 CM IN DIAMETER AND 215 CM HIGH. THE ANTENNAS IN THE X-Y PLANE ARE 215-CM TIP-TO-TIP, AND ON THE Z-AXIS ARE 15-M TIP-TO-TIP. TWO 3-M BOOMS ARE PROVIDED FOR REMOTE MEASUREMENTS. THE TOTAL MASS OF THE INSTRUMENTS IS 55 KG. POWER IS SUPPLIED BY A SOLAR CELL ARRAY. THE SPACECRAFT IS SPIN STABILIZED. THE SPIN AXIS IS 90 DEG FROM THE ORBIT NORMAL AND THE PLANNED SPIN RATE IS 64 (PLUS OR MINUS 10 PERCENT) RPM. A PULSE CODE MODULATION (PCM) TELEMETRY DATA SYSTEM IS USED THAT OPERATES IN REAL TIME OR A TAPE RECORDER MODE. DATA ARE ACQUIRED ON A SCIENCE PROBLEM ORIENTED BASIS, WITH CLOSELY COORDINATED OPERATIONS OF THE VARIOUS INSTRUMENTS, BOTH SATELLITES, AND SUPPORTIVE EXPERIMENTS.

----- DYNAMICS EXPLORER-A, BURCH-----

INVESTIGATION NAME- HIGH ALTITUDE PLASMA INSTRUMENT

NSSDC ID- DE-A -05

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL

PI - J.L. BURCH  
OI - R.A. HOFFMAN  
OI - J.D. WINNINGHAM  
OI - D.M. KLUMPAR

SOUTHWEST RES INST  
NASA-GSFC  
U OF TEXAS, DALLAS  
U OF TEXAS, DALLAS

**BRIEF DESCRIPTION**

THE HIGH-ALTITUDE PLASMA INSTRUMENT (HAPI) CONSISTS OF AN ARRAY OF ELECTROSTATIC ANALYZERS CAPABLE OF MAKING MEASUREMENTS OF THE PHASE-SPACE DISTRIBUTIONS OF ELECTRONS AND POSITIVE IONS FROM 5 EV TO 32 KEV AS A FUNCTION OF PITCH ANGLE. THIS INVESTIGATION PROVIDES DATA CONTRIBUTING TO THE STUDIES OF: (1) THE COMPOSITION AND ENERGY OF BIRKELAND CURRENT CHARGE CARRIERS; (2) THE DYNAMIC CONFIGURATION OF HIGH-LATITUDE MAGNETIC FLUX TUBES; (3) AURORAL PARTICLE SOURCE REGIONS AND ACCELERATION MECHANISMS; (4) THE ROLE OF E PARALLEL TO B, AND E PERPENDICULAR TO B IN THE MAGNETOSPHERE-IONOSPHERE SYSTEM; (5) THE SOURCES AND THE EFFECT OF POLAR CAP PARTICLE FLUXES; (6) THE TRANSPORT OF PLASMA WITHIN AND THROUGH THE MAGNETOSPHERIC CLEFTS; (7) WAVE-PARTICLE INTERACTIONS; AND (8) HOT-COLD PLASMA INTERACTIONS. THIS INSTRUMENT CONSISTS OF FIVE IDENTICAL DETECTOR HEADS, EACH HAVING AN ELECTROSTATIC ANALYZER (OF THE ISIS-2 TYPE) AND TWO SENSORS (ONE ELECTRON CHANNEL AND ONE ION CHANNEL). THE DETECTOR HEADS ARE MOUNTED ON THE MAIN BODY. THREE OF THE DETECTOR HEADS ARE MOUNTED IN THE SPIN PLANE, AND THE OTHER TWO ARE OFFSET BY PLUS AND MINUS 12 DEG. ONE DETECTOR SWEEPS WITHIN A FEW DEG OF THE FIELD LINE DURING EACH ROTATION OF THE SPACECRAFT, EXCEPT WHEN THE MAGNETIC FIELD IS GREATLY DEFORMED FROM ITS MERIDIAN PLANE. THE BASIC MODE OF OPERATION PROVIDES A 32-POINT ENERGY SPECTRUM FROM EACH SENSOR, BUT THE VOLTAGES ON THE ELECTROSTATIC ANALYZERS ARE PROGRAMMABLE TO ALLOW FOR OPERATION OVER LIMITED PORTIONS OF THE ENERGY SPECTRUM, OR AT HIGHER TIME RESOLUTION WITH REDUCED ENERGY RESOLUTION.

----- DYNAMICS EXPLORER-A, CHAPPELL -----

**INVESTIGATION NAME- RETARDING ION MASS SPECTROMETER**

NSSDC ID- DE-A -04

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS**PERSONNEL**

PI - C.R. CHAPPELL	NASA-MSFC
OI - P.M. BANKS	UTAH STATE U
OI - W.B. HANSON	U OF TEXAS, DALLAS
OI - J.H. HOFFMAN	U OF TEXAS, DALLAS
OI - A.F. NAGY	U OF MICHIGAN
OI - G.R. CARIGNAN	U OF MICHIGAN

**BRIEF DESCRIPTION**

THE RETARDING ION MASS SPECTROMETER (RIMS) CONSISTS OF A RETARDING POTENTIAL ANALYZER FOR ENERGY ANALYSIS IN SERIES WITH A MAGNETIC ION MASS SPECTROMETER FOR MASS ANALYSIS. THIS INSTRUMENT IS DESIGNED TO OPERATE IN TWO BASIC COMMANDABLE MODES: A HIGH-ALTITUDE MODE IN WHICH THE DENSITY, TEMPERATURE, AND BULK FLOW CHARACTERISTICS OF H<sup>+</sup>, HE<sup>+</sup>, AND O<sup>+</sup> IONS ARE MEASURED, AND A LOW-ALTITUDE MODE THAT CONCENTRATES ON THE COMPOSITION IN THE 1- TO 32-U RANGE. THIS INVESTIGATION PROVIDES INFORMATION ON: (1) THE DENSITIES OF H<sup>+</sup>, HE<sup>+</sup>, AND O<sup>+</sup> IONS IN THE IONOSPHERE, PLASMAPAUSE, PLASMA TROUGH, AND POLAR CAP (INCLUDING THE DENSITY DISTRIBUTION ALONG THE MAGNETIC VECTOR IN THE VICINITY OF THE SATELLITE APOGEE); (2) THE TEMPERATURE OF H<sup>+</sup>, HE<sup>+</sup>, AND O<sup>+</sup> IONS IN THE IONOSPHERE, PLASMAPAUSE, PLASMA TROUGH, AND POLAR CAP (ENERGY RANGE 0-45 EV); (3) THE BULK FLOW VELOCITIES OF H<sup>+</sup>, HE<sup>+</sup>, AND O<sup>+</sup> IN THE PLASMAPAUSE, PLASMA TROUGH AND POLAR CAP; (4) THE CHANGING CHARACTER OF THE COLD PLASMA DENSITY, TEMPERATURE, AND BULK FLOW IN REGIONS OF INTERACTION WITH HOT PLASMA SUCH AS AT THE BOUNDARY BETWEEN THE PLASMAPAUSE AND THE RING CURRENTS; AND (5) THE DETAILED COMPOSITION OF IONOSPHERIC PLASMA IN THE 1- TO 32-U RANGE. THE INSTRUMENT CONSISTS OF THREE DETECTOR HEADS. ONE LOOKS OUT IN THE RADIAL DIRECTION, AND THE OTHER TWO ARE ALONG THE PLUS AND MINUS SPIN AXIS DIRECTION. EACH DETECTOR HAS A 55 DEG HALF-CONE ACCEPTANCE ANGLE. THE DETECTOR HEADS HAVE A GRIDDED WEAKLY COLLIMATING APERTURE WHERE THE RETARDING ANALYSIS IS PERFORMED, FOLLOWED BY A PARALLEL PLATE CERAMIC MAGNETIC MASS ANALYZER WITH THREE SEPARATE EXIT SLITS CORRESPONDING TO ION MASSES IN THE RATIO 1:4:16. IONS EXITING FROM THESE SLITS ARE DETECTED WITH ELECTRON MULTIPLIERS. IN THE APOGEE MODE THE THERMAL PARTICLE FLUXES ARE MEASURED AS THE POTENTIAL ON A SET OF RETARDING GRIDS THAT ARE STEPPED THROUGH A SEQUENCE OF SETTINGS. IN THE PERIGEE MODE, THE RETARDING GRIDS ARE GROUNDED AND THE DETECTOR UTILIZES A CONTINUOUS ACCELERATION POTENTIAL SWEEP THAT FOCUSES THE MASS RANGES FROM 1 TO 2, 4 TO 10, AND 14 TO 34 U ON THE LOW-, MID-, AND HIGH-MASS SENSORS, RESPECTIVELY.

----- DYNAMICS EXPLORER-A, CORONITI -----

**INVESTIGATION NAME- AURORAL PHYSICS**

NSSDC ID- DE-A -07

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
UPPER ATMOSPHERE RESEARCH**PERSONNEL**

PI - F.V. CORONITI	U OF CALIF, LA
OI - C.F. KENNEL	U OF CALIF, LA
OI - J.E. MAGGS	U OF CALIF, LA

**BRIEF DESCRIPTION**

THE PRIMARY GOAL OF THIS INVESTIGATION IS TO USE THE RESULTS FROM OTHER EXPERIMENTS, PARTICULARLY DE-A-03 (FRANK) TO TEST PREVIOUS THEORETICAL MODELS AND TO DEVELOP NEW ONES, WITH EMPHASIS ON RESEARCH AREAS RELATED TO AURORAL ARCS, FIELD-ALIGNED CURRENTS, PLASMA WAVE TURBULENCE ASSOCIATED WITH ANOMALOUS RESISTANCE, GENERATION OF AURORAL ELECTRON BEAMS, PRODUCTION OF KILOMETRIC AND VLF HISS RADIATION, AND SPREAD-F. IN ADDITION, CORRELATION STUDIES ARE ORGANIZED BY SELECTING EVENTS THAT ARE INTERESTING TO THE VARIOUS INVESTIGATORS AND DATA REDUCTION PROCEDURES ARE SUGGESTED TO FACILITATE COMPARISON AND INTERPRETATION OF THE DATA.

----- DYNAMICS EXPLORER-A, FRANK -----

**INVESTIGATION NAME- GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS**

NSSDC ID- DE-A -03

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
UPPER ATMOSPHERE RESEARCH  
IONOSPHERES**PERSONNEL**

PI - L.A. FRANK	U OF IOWA
OI - K.L. ACKERSON	U OF IOWA
OI - R.L. CAROVILLANO	BOSTON COLLEGE
OI - R.M. EATHER	BOSTON COLLEGE

**BRIEF DESCRIPTION**

THE SPIN-SCAN AURORAL IMAGER (SAI) PROVIDES GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS. IT ACQUIRES: (1) IMAGES AT SEVERAL VISIBLE WAVELENGTHS; (2) IMAGES WITHIN A VACUUM ULTRAVIOLET 'WINDOW', WHICH ALLOWS USABLE IMAGING OF THE AURORA IN THE SUNLIT IONOSPHERE; AND (3) PHOTOMETRIC MEASUREMENTS OF THE HYDROGEN CORONA. THIS INVESTIGATION PROVIDES DATA THAT SIGNIFICANTLY ADVANCE THE KNOWLEDGE OF (1) THE SPATIAL AND TEMPORAL CHARACTER OF THE ENTIRE AURORAL OVAL AT BOTH VISIBLE AND VACUUM ULTRAVIOLET WAVELENGTHS (WITH GOOD TIME RESOLUTION); (2) THE ASSOCIATION OF AURORAL AND MAGNETOSPHERIC PLASMAS WITH THE DIVERSE AURORAL EMISSION FEATURES; (3) THE RELATIONSHIP OF THE AURORAL EMISSIONS WITH FIELD-ALIGNED CURRENTS; (4) THE ENERGY DEPOSITED IN THE AURORAL IONOSPHERE BY CHARGED PARTICLES; (5) THE ACCELERATION MECHANISM RESPONSIBLE FOR 'INVERTED-V' PRECIPITATION EVENTS; (6) THE ROLE OF THE POLAR CAP AND MAGNETOTAIL IN AURORAL AND MAGNETOSPHERIC DYNAMICS, AND (7) THE TIME-DEPENDENT DISTRIBUTION OF NEUTRAL HYDROGEN IN THE RING CURRENT AND POLAR REGIONS. FOR VISIBLE WAVELENGTHS, THE PHOTOMETERS HAVE A WIDE-ANGLE COLLIMATOR; A SUPER-REFLECTING SCANNING MIRROR; A MIRROR DRIVE MOTOR; A QUARTZ FIELD LENS; AN IMAGE-VIEWING ASSEMBLY OF FIELD-STOP, PINHOLE AND COLLIMATING LENS; A FILTER WHEEL WITH NARROW-BAND INTERFERENCE FILTERS WITH HALF-POWER BANDWIDTHS OF 8 Å CENTERED AT 5577 Å, 6300 Å, AND 3914 Å; AND A SMALL PHOTOMULTIPLIER TUBE WITH AN EXTENDED RED PHOTOCATHODE. THE VACUUM ULTRAVIOLET IMAGING PHOTOMETER IS A SPIN-SCAN NEWTONIAN TELESCOPE. THE FIRST OPTICAL ELEMENT IS AN ALUMINUM SCANNING MIRROR WITH A MgF<sub>2</sub> OVERCOAT. THE COLLIMATION AND MIRROR DRIVE ARE SIMILAR TO THOSE DESCRIBED PREVIOUSLY FOR THE VISIBLE IMAGING PHOTOMETER. A FILTER WHEEL WITH MgF<sub>2</sub>, CaF<sub>2</sub>, AND BaF<sub>2</sub> FILTERS ALLOWS GLOBAL IMAGING FROM 1370 Å TO 1700 Å, AT 1304 Å, 1356 Å, AND 1216 Å. THE DETECTOR IS A PHOTOMULTIPLIER TUBE WITH A CSI PHOTOCATHODE AND A MgF<sub>2</sub> WINDOW.

----- DYNAMICS EXPLORER-A, HELLIWELL -----

**INVESTIGATION NAME- CONTROLLED AND NATURALLY-OCCURRING WAVE PARTICLE INTERACTIONS**

NSSDC ID- DE-A -08

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
RADIO PHYSICS**PERSONNEL**

PI - R.A. HELLIWELL	STANFORD U
OI - J.F. BELL	STANFORD U
OI - D.L. CARPENTER	STANFORD U
OI - C.G. PARK	STANFORD U
OI - J.B. REAGAN	LOCKHEED PALO ALTO

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES A GROUND-BASED VERY-LOW-FREQUENCY/LOW-FREQUENCY (VLF/LF) (0.5-200 kHz) TRANSMITTER LOCATED AT SIPLE, ANTARCTICA, AT AN L VALUE OF ABOUT 4, AND THE BROAD-BAND MAGNETIC FIELD DETECTOR FROM EXPERIMENT DE-A-02. THE PRIMARY OBJECTIVE OF THE INVESTIGATION IS TO DETERMINE THE RELATIONSHIP BETWEEN VLF/LF WAVES AND ENERGETIC ELECTRONS IN THE MAGNETOSPHERE WITH EMPHASIS ON WAVE GROWTH, STIMULATED EMISSIONS, AND WAVE-INDUCED PERTURBATIONS OF THE ENERGETIC ELECTRONS. OTHER OBJECTIVES ARE TO: (1) DETERMINE HOW WAVE PROPAGATION FROM BOTH GROUND AND MAGNETOSPHERIC SOURCES IS AFFECTED BY FIELD-ALIGNED PLASMA STRUCTURES SUCH AS THE PLASMAPAUSE AND DUCTS OF ENHANCED IONIZATION, (2) USE THE WAVE DATA TO DESCRIBE THE STRUCTURE OF THE PLASMAPAUSE AND THE DISTRIBUTION OF IONIZATION ALONG FIELD-ALIGNED DUCTS, AND (3) STUDY THE EFFECTS OF EARTH POWER-LINE RADIATION AND OTHER VLF WAVE ACTIVITY. THE BROAD-BAND MAGNETIC FIELD DATA ARE OBTAINED FROM THE LOOP

ORIGINAL PAGE IS  
OF POOR QUALITY

ANTENNA, SELECTABLE IN THREE BANDS: 2 TO 4-, 4 TO 8-, AND 8 TO 16 KHZ.

----- DYNAMICS EXPLORER-A, SHAWHAN -----

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- DE-A -02 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

PERSONNEL  
PI - S.D. SHAWHAN  
OI - D.A. GURNETT

U OF IOWA  
U OF IOWA

BRIEF DESCRIPTION

THE PLASMA WAVE INSTRUMENT (PWI) MEASURES ELECTRIC FIELDS FROM 1 HZ TO 2 MHZ, MAGNETIC FIELDS FROM 1 HZ TO 400 KHZ, AND THE DC POTENTIAL DIFFERENCE BETWEEN THE ELECTRIC DIPOLE ELEMENTS. THE OBJECTIVES OF THIS INVESTIGATION ARE TO MEASURE THE SPATIAL, TEMPORAL, SPECTRAL, AND WAVE CHARACTERISTICS (PARTICULARLY THE POINTING VECTOR COMPONENT ALONG THE MAGNETIC FIELD LINE) AND THE WAVE POLARIZATION FOR EXTREMELY-LOW-FREQUENCY (ELF), VERY-LOW-FREQUENCY (VLF), AND HIGH-FREQUENCY (HF) NOISE PHENOMENA. OF SPECIAL INTEREST ARE THE AURORAL KILOMETRIC RADIATION AND VLF HISS, AND A VARIETY OF ELECTROSTATIC WAVES THAT MAY CAUSE FIELD-ALIGNED ACCELERATION OF PARTICLES. THE INVESTIGATION MAKES USE OF THE LONG DIPOLE ANTENNAS AND A MAGNETIC LOOP ANTENNA. A SINGLE-AXIS SEARCH COIL MAGNETOMETER AND A SHORT ELECTRIC ANTENNA ARE INCLUDED FOR LOW-FREQUENCY MEASUREMENTS AND ELECTROSTATIC NOISE AT SHORT WAVELENGTHS. THE ELECTRONICS CONSISTS OF: (1) A WIDEBAND/LONG BASELINE RECEIVER WITH A BANDWIDTH OF 10 OR 40 KHZ FROM 0-2 MHZ; (2) A SWEEP-FREQUENCY CORRELATOR, CONTAINING TWO SWEEP-FREQUENCY RECEIVERS AND PHASE DETECTORS, SWEEPING 100 HZ TO 400 KHZ IN 32 SECONDS; GIVES THE PHASE BETWEEN MAGNETIC AND ELECTRIC COMPONENTS OF THE FIELDS; (3) A LOW-FREQUENCY CORRELATOR CONTAINING TWO FILTER RECEIVERS AND PHASE DETECTORS. EIGHT FILTERS IN THE RANGE 1.78-100 HZ ARE SWEEPED IN 8 SEC; (4) DC MONITORS TO MEASURE THE VOLTAGE DIFFERENCE BETWEEN THE TWO SETS OF LONG DIPOLE ANTENNAS; (5) A LINEAR WIDEBAND RECEIVER, SELECTABLE FROM 2- TO 4-, 4- TO 8-, OR 8- TO 16-KHZ BANDS.

----- DYNAMICS EXPLORER-A, SHELLEY -----

INVESTIGATION NAME- HOT PLASMA COMPOSITION

NSSDC ID- DE-A -06 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES  
MAGNETOSPHERIC PHYSICS

PERSONNEL  
PI - E.G. SHELLEY  
OI - R.G. JOHNSON  
OI - R.D. SHARP  
OI - J. GEISS  
OI - P.X. EBERHARDT  
OI - H. BALSIGER  
OI - D.T. YOUNG  
OI - A. GHIELMETTI  
OI - B.A. WHALEN

LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
U OF BERNE  
NATL RES COUNC OF CAN

BRIEF DESCRIPTION

THE ENERGETIC ION COMPOSITION SPECTROMETER (EICS) HAS HIGH SENSITIVITY AND HIGH RESOLUTION, AND COVERS THE ENERGY RANGE FROM 0 TO 17 KEV PER UNIT CHARGE AND THE MASS RANGE FROM 1 TO 138 U. THIS INVESTIGATION PROVIDES DATA USED IN INVESTIGATING THE STRONG COUPLING MECHANISM BETWEEN THE MAGNETOSPHERE AND THE IONOSPHERE THAT RESULTS IN LARGE FLUXES OF ENERGETIC O<sup>+</sup> IONS BEING ACCELERATED FROM THE IONOSPHERE AND INJECTED INTO THE MAGNETOSPHERE DURING MAGNETIC STORMS. THE PROPERTIES OF THE MINOR IONIC SPECIES SUCH AS He<sup>+</sup> AND He<sup>++</sup> RELATIVE TO THE MAJOR CONSTITUENTS OF THE ENERGETIC MAGNETOSPHERE PLASMA ARE ALSO STUDIED IN ORDER TO EVALUATE THE RELATIVE IMPORTANCE OF THE DIFFERENT SOURCES OF THE PLASMA AND OF VARIOUS ENERGIZATION, TRANSPORT, AND LOSS PROCESSES THAT MAY BE MASS- OR CHARGE-DEPENDENT. THE INSTRUMENT IS SIMILAR TO ONE FLOWN ON THE ISEE 1 SATELLITE. IT CONSISTS OF A CURVED-PLATE ELECTROSTATIC ENERGY ANALYZER FOLLOWED BY A COMBINED CYLINDRICAL ELECTROSTATIC-MAGNETIC MASS ANALYZER WITH ELECTRON MULTIPLIERS USED AS DETECTORS. THE ENERGY ANALYZER CAN BE OPERATED IN TWO BASIC ENERGY RANGES, LOW AND HIGH. IN THE HIGH-ENERGY RANGE, THE PLATE POTENTIALS ARE PROGRAMMABLE IN 32 STEPS SUCH THAT THE ENERGY-PER-UNIT CHARGE IS MEASURED IN THE RANGE BETWEEN 0.10 AND 17 KEV WITH NEARLY EQUAL LOGARITHMIC STEPS. AT THE LOWEST STEP THE ANALYZER BECOMES TRANSPARENT TO ALL IONS WITH ENERGY LESS THAN ABOUT 150 EV. IN THIS LOW-ENERGY RANGE, THE ANALYZER IS HELD ON THIS STEP AND INTEGRAL ENERGY ANALYSIS BETWEEN ZERO AND 150 EV IS PERFORMED WITH A RETARDING POTENTIAL ANALYZER THAT PRECEDES THE PREACCELERATION SECTION. THE MASS ANALYZER CONSISTS OF A CYLINDRICAL-PLATE ELECTROSTATIC ANALYZER BETWEEN THE POLES OF A PERMANENT MAGNET. OPEN MULTIPLIERS ARE USED WITH PULSE-AMPLITUDE DISCRIMINATION AS THE MASS ANALYZER DETECTORS IN ORDER TO IMPROVE THE MASS SEPARATION CHARACTERISTICS OF THE SPECTROMETER.

----- DYNAMICS EXPLORER-A, SUGIURA -----

INVESTIGATION NAME- MAGNETIC FIELD OBSERVATIONS

NSSDC ID- DE-A -01 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M. SUGIURA  
OI - B.G. LEDLEY  
OI - W.H. FARTHING  
OI - L.J. CAHILL, JR.

NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
U OF MINNESOTA

BRIEF DESCRIPTION

THIS INVESTIGATION USES A TRIAXIAL FLUXGATE MAGNETOMETER (MAG-A), SIMILAR TO ONE ON BOARD DE-B, TO OBTAIN VECTOR MAGNETIC FIELD DATA NEEDED TO STUDY THE MAGNETOSPHERE-IONOSPHERE-ATMOSPHERE COUPLING. THE PRIMARY OBJECTIVE OF THIS INVESTIGATION IS TO OBTAIN MEASUREMENTS OF FIELD-ALIGNED CURRENTS IN THE AURORAL OVAL AND OVER THE POLAR CAP AT TWO DIFFERENT ALTITUDES. THIS IS ACCOMPLISHED USING THE TWO SPACECRAFT AND CORRELATIONS OF THESE MEASUREMENTS WITH OBSERVATIONS OF ELECTRIC FIELDS, PLASMA WAVES, SUPRATHERMAL PARTICLES, THERMAL PARTICLES, AND WITH AURORAL IMAGES OBTAINED FROM INVESTIGATION DE-A-03. THE MAGNETOMETER INCORPORATES ITS OWN 12-BIT A-D CONVERTER, A 4-BIT DIGITAL COMPENSATION REGISTER FOR EACH AXIS, AND A SYSTEM CONTROL TO GENERATE A 48-BIT DATA WORD CONSISTING OF A 16-BIT REPRESENTATION OF THE FIELD MEASURED ALONG EACH OF THE THREE MAGNETOMETER AXES. TRACK AND HOLD MODULES ARE USED TO OBTAIN SIMULTANEOUS SAMPLES ON ALL THREE AXES. INSTRUMENT BANDWIDTH IS 25 HZ. THE INSTRUMENT RANGE IS UP TO 61,000 NT. THE ACCURACY IS PLUS OR MINUS 4 NT, AND THE RESOLUTION IS: PLUS OR MINUS 1.5 NT IN THE 61,000 NT RANGE, PLUS OR MINUS 0.25 NT IN THE 1,000 NT RANGE, AND PLUS OR MINUS 0.02 NT IN THE 80 NT RANGE. THE MAGNETOMETER'S DIGITAL COMPENSATION OF THE AMBIENT FIELD IS IN PRECISE 8000 NT INCREMENTS.

\*\*\*\*\* DYNAMICS EXPLORER-B \*\*\*\*\*

SPACECRAFT COMMON NAME- DYNAMICS EXPLORER-B  
ALTERNATE NAMES- DE-B

NSSDC ID- DE-B

LAUNCH DATE- 07/31/81  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101. MIN  
PERIAPSIS- 305. KM ALT

INCLINATION- 90.0 DEG  
APOAPSIS- 1300. KM ALT

PERSONNEL  
MG - M.B. WEINREB  
SC - E.B. SCHERLING  
PM - G.D. MOGAN  
PS - R.N. HOFFMAN

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE DE-B SPACECRAFT (LOW-ALTITUDE MISSION) COMPLEMENTS THE HIGH-ALTITUDE MISSION (DE-A) AND IS PLACED INTO AN ORBIT WITH A PERIGEE SUFFICIENTLY LOW TO PERMIT MEASUREMENTS OF NEUTRAL COMPOSITION, TEMPERATURE, AND WIND. THE APOGEE IS HIGH ENOUGH TO PROVIDE DE-B WITH A LIFETIME OF GREATER THAN 18 MONTHS AND PERMITS MEASUREMENTS ABOVE THE INTERACTION REGIONS OF SUPRATHERMAL IONS AND PLASMA FLOW MEASUREMENTS AT THE END OF THE MAGNETOSPHERIC FIELD LINES. THE SPACECRAFT APPROXIMATES A SHORT RIGHT CYLINDER 137 CM IN DIAMETER AND 115 CM HIGH. THE TRIAXIAL ANTENNAS ARE 23 M TIP-TO-TIP. ONE 3-M BOOM IS PROVIDED FOR REPOLE MEASUREMENTS. THE INSTRUMENT PACKAGE HAS A MASS OF 75 KG. POWER IS SUPPLIED BY A SOLAR CELL ARRAY. THE SPACECRAFT IS THREE-AXIS STABILIZED WITH THE YAW AXIS ALIGNED TOWARD THE CENTER OF THE EARTH TO WITHIN 1 DEG. THE SPIN AXIS IS NORMAL TO THE ORBIT PLANE WITHIN 1 DEG WITH A SPIN RATE OF ONE REVOLUTION PER ORBIT. A SINGLE-AXIS SCAN PLATFORM WAS INCLUDED IN ORDER TO MOUNT THE LOW-ALTITUDE PLASMA INSTRUMENT (DE-B-08). THE PLATFORM ROTATES ABOUT THE SPIN AXIS. A PC TELEMETRY DATA SYSTEM IS USED THAT OPERATES IN REAL TIME OR IN A TAPE RECORDER MODE. DATA ARE ACQUIRED ON A SCIENCE PROBLEM ORIENTED BASIS, WITH CLOSELY COORDINATED OPERATIONS OF THE VARIOUS INSTRUMENTS, BOTH SATELLITES, AND SUPPORTIVE EXPERIMENTS.

----- DYNAMICS EXPLORER-B, BRACE -----

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- DE-B -09

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PARTICLES AND FIELDS  
IONOSPHERES

**PERSONNEL**

PI - L.H.	BRACE	NASA-GSFC
OI - M.R.	HOEGY	NASA-GSFC
OI - R.F.	THEIS	NASA-GSFC
OI - K.D.	COLE	LA TROBE U
OI - G.R.	CARIGNAN	U OF MICHIGAN

**BRIEF DESCRIPTION**

THE LANGMUIR PROBE INSTRUMENT (LANG) IS A CYLINDRICAL ELECTROSTATIC PROBE THAT OBTAINS MEASUREMENTS OF ELECTRON TEMPERATURE, TE, AND ELECTRON OR ION CONCENTRATION, NE OR NI, RESPECTIVELY, DENSITY IRREGULARITIES, AND SPACECRAFT POTENTIAL. DATA FROM THIS INVESTIGATION ARE USED TO PROVIDE TEMPERATURE AND DENSITY MEASUREMENTS ALONG MAGNETIC FIELD LINES RELATED TO THERMAL ENERGY AND PARTICLE FLOWS WITHIN THE MAGNETOSPHERE-IONOSPHERE SYSTEM, TO PROVIDE THERMAL PLASMA CONDITIONS FOR WAVE-PARTICLE INTERACTIONS, AND TO MEASURE LARGE-SCALE AND FINE-STRUCTURE IONOSPHERIC EFFECTS OF ENERGY DEPOSITION IN THE IONOSPHERE. THE LANGMUIR PROBE INSTRUMENT IS IDENTICAL TO THAT USED ON THE AE SATELLITES AND THE PIONEER VENUS ORBITER. THE INSTRUMENT EMPLOYS TWO INDEPENDENTLY OPERATED CYLINDRICAL COLLECTORS, EACH MOUNTED AT THE END OF A .5 M LONG BOOM. EACH COLLECTOR IS 5 CM LONG AND 0.3 CM IN DIAMETER. AN ELECTRONIC UNIT APPLIES APPROPRIATE VOLTAGE WAVEFORMS TO EACH PROBE AND MEASURES THE RESULTING CURRENTS THAT ARE DRAWN FROM THE IONOSPHERIC PLASMA SURROUNDING THE SPACECRAFT. THESE CURRENTS ARE INTRODUCED TO CIRCUITS THAT ARE ABLE TO PERFORM AN IN-FLIGHT ANALYSIS OF THE DATA FOR TE, NE, AND NI. THIS GREATLY REDUCES THE REQUIREMENT FOR HIGH TELEMETRY DATA RATES AND PERMITS INCREASED SPATIAL RESOLUTION OF THE MEASUREMENTS. SPACECRAFT POTENTIAL CAN ALSO BE DETERMINED FROM THESE MEASUREMENTS. THE INSTRUMENT HAS SELECTABLE MODES OF OPERATION THAT PROVIDE VARIOUS DEGREES OF SPATIAL RESOLUTION. MAXIMUM RESOLUTION FOR NE OR NI IS OBTAINED BY FIXING THE POTENTIAL OF ONE PROBE AND CONTINUOUSLY SAMPLING THE RESULTING RESPECTIVE ELECTRON OR ION CURRENT. THE RESOLUTION IS LIMITED ONLY BY THE SAMPLING RATE ASSIGNED TO THE INSTRUMENT. SIMULTANEOUSLY, THE OTHER PROBE CAN MEASURE NI AT A RATE OF UP TO 50 TO 100 PER SECOND, DEPENDING ON THE TELEMETRY RATE AVAILABLE. AT NOMINAL RATES (1000 BPS) TE AND NE ARE MEASURED ABOUT ONE OR TWO TIMES PER SECOND.

**----- DYNAMICS EXPLORER-B, CARIGNAN-----****INVESTIGATION NAME- NEUTRAL ATMOSPHERE COMPOSITION SPECTROMETER**

NSSDC ID- DE-B -03

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - G.R.	CARIGNAN	U OF MICHIGAN
OI - N.W.	SPENCER	NASA-GSFC
OI - C.A.	REBER	NASA-GSFC
OI - A.E.	HEDIN	NASA-GSFC

**BRIEF DESCRIPTION**

THE NEUTRAL ATMOSPHERE COMPOSITION SPECTROMETER (NACS) IS DESIGNED TO OBTAIN IN SITU MEASUREMENTS OF THE NEUTRAL ATMOSPHERIC COMPOSITION AND TO STUDY THE VARIATIONS OF THE NEUTRAL ATMOSPHERE IN RESPONSE TO ENERGY COUPLED INTO IT FROM THE MAGNETOSPHERE. BECAUSE TEMPERATURE ENHANCEMENTS, LARGE-SCALE CIRCULATION CELLS, AND WAVE PROPAGATION ARE PRODUCED BY ENERGY INPUT (EACH OF WHICH POSSESSES A SPECIFIC SIGNATURE IN COMPOSITION VARIATION), THE MEASUREMENTS PERMIT THE STUDY OF THE PARTITION, FLOW, AND DEPOSITION OF ENERGY FROM THE MAGNETOSPHERE. THE QUADRUPLE PASS SPECTROMETER USED IS A NEARLY IDENTICAL FOLLOW-ON TO THOSE FLOWN ON THE AE-C, -D, AND -E MISSIONS. THE ELECTRON IMPACT ION SOURCE IS USED IN A CLOSED MODE. ATMOSPHERIC PARTICLES ENTER INTO AN ANTECHAMBER THROUGH A KNIFE-EDGED ORIFICE, WHERE THEY ARE THERMALIZED TO THE INSTRUMENT TEMPERATURE. THE IONS WITH THE SELECTED CHARGE-TO-MASS RATIOS HAVE STABLE TRAJECTORIES THROUGH THE HYPERBOLIC ELECTRIC FIELD AND EXIT THE ANALYZER AND ENTER INTO THE DETECTION SYSTEM. AN OFF-AXIS BERYLLIUM-COPPER DYNODE MULTIPLIER OPERATING AT A GAIN OF 2.6E Provides AN OUTPUT PULSE OF ELECTRONS FOR EACH ION ARRIVAL. THE DETECTOR OUTPUT IS A PULSE RATE PROPORTIONAL TO THE NEUTRAL DENSITY IN THE ION SOURCE OF THE SELECTED MASS. THE INSTRUMENT ALSO INCLUDES TWO BAFFLES THAT SCAN ACROSS THE INPUT ORIFICE FOR OPTIONAL MEASUREMENT OF THE TRANSVERSE COMPONENTS OF THE NEUTRAL WIND. THE INSTRUMENT COVERS THE ENTIRE MASS RANGE FROM 1 TO 48 U, BUT NORMALLY IS USED IN A SELECTED MASS STEPPING MODE WHERE MASS NUMBERS 4, 28, 30, 32, AND 40 ARE SAMPLED SEQUENTIALLY WITH A SPATIAL RESOLUTION OF 4 KM. THE TIME RESOLUTION NEEDED TO DETERMINE THE ABUNDANCE OF GAS AT A SINGLE MASS IS 16 MILLISECONDS. OPERATIONAL ALTITUDES ARE BETWEEN 200 KM AND 500 KM WITH REDUCED CAPABILITY AS LOW AS 150 KM AND AS HIGH AS 600 KM.

**----- DYNAMICS EXPLORER-B, HANSON-----****INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER**

NSSDC ID- DE-B -07

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
SPACE PLASMAS  
ATMOSPHERIC PHYSICS  
IONOSPHERES

**PERSONNEL**

PI - W.B.	HANSON	U OF TEXAS, DALLAS
OI - R.A.	HEELIS	U OF TEXAS, DALLAS
OI - D.R.	ZUCCARO	U OF TEXAS, DALLAS
OI - C.R.	LIPPENCOTT	U OF TEXAS, DALLAS

**BRIEF DESCRIPTION**

THE RETARDING POTENTIAL ANALYZER (RPA) PROVIDES DATA ON TEMPERATURE, COMPOSITION, CONCENTRATION, AND THE BULK VELOCITY OF POSITIVE IONS NOMINALLY PARALLEL TO THE VEHICLE VELOCITY. THE MEASURED PARAMETERS OBTAINED FROM THIS INVESTIGATION ARE BASIC TO THE UNDERSTANDING OF MECHANISMS THAT INFLUENCE THE PLASMA; I.E., TO UNDERSTAND THE COUPLING BETWEEN THE SOLAR WIND AND THE EARTH'S ATMOSPHERE. THE ANALYZER DEFINES THE ION TEMPERATURE IN THE REGIONS WHERE THE CONCENTRATION, N(I), IS GREATER THAN 100 IONS PER CU CM, AND DETERMINES THE VALUE OF N(I) FROM ITS MAXIMUM VALUE DOWN TO APPROXIMATELY 50 IONS PER CU CM. THE RPA PROVIDES THE BEST ABSOLUTE VALUE FOR N(I) OF THE IN SITU MEASURING INSTRUMENTS ON THE SPACECRAFT, AND IS ALSO CAPABLE OF MEASURING FRACTIONAL CHANGES IN N(I) OF LESS THAN 0.1 PERCENT WITH HIGH SPATIAL RESOLUTION. THE FRACTIONAL CHANGES IN N(I) ARE CALLED THE IRREGULARITY INDEX. THE MEASUREMENTS ARE MADE WITH A MULTIGRIDDED PLANAR RETARDING POTENTIAL ANALYZER VERY SIMILAR IN CONCEPT AND GEOMETRY TO THE INSTRUMENTS CARRIED ON THE AE SATELLITES. THE DUCT SENSOR HAS A SEPARATE APERTURE. A PAIR OF APERTURE GRIDS ARE HELD AT SPACECRAFT GROUND AND A SECOND PAIR OF GRIDS COMPRIMES THE RETARDING SWEEP GRID. THE POTENTIAL ON THESE GRIDS DETERMINES THE ENERGY OF THE IONS IN THE SPACECRAFT FRAME OF REFERENCE THAT CAN REACH THE ELECTROMETER COLLECTOR. THE RETARDING POTENTIAL IS VARIED IN DIFFERENT SEQUENCES TO PROVIDE INFORMATION ON THE ION THERMAL ENERGY DISTRIBUTION. THE ELECTRICALLY NEGATIVE SUPPRESSOR GRID BETWEEN THE SWEEP GRID AND THE COLLECTOR SERVES TO SUPPRESS SOLAR UV EJECTED PHOTOELECTRONS BY SENDING THEM BACK TO THE COLLECTOR AND ALSO SHIELDS THE COLLECTOR FROM AMBIENT ELECTRONS. THE ION CURRENT-RETARDING VOLTAGE CHARACTERISTICS ARE ANALYZED BY FITTING THEORETICAL CURVES TO THE DATA ON A COMPUTER USING LEAST SQUARES TECHNIQUES. PARAMETERS THAT ARE DEDUCED FROM THIS PROCESS ARE: ION TEMPERATURE; VEHICLE POTENTIAL; RAM COMPONENT OF THE ION DRIFT VELOCITY; THE ION AND ELECTRON CONCENTRATION IRREGULARITY SPECTRUM; AND THE CONCENTRATION OF H+, HE+, O+, AND FE+, AND MOLECULAR IONS O2+, NO+, AND N2+.

**----- DYNAMICS EXPLORER-B, HAYS-----****INVESTIGATION NAME- FABRY-PEROT INTERFEROMETER**

NSSDC ID- DE-B -05

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - P.B.	HAYS	U OF MICHIGAN
OI - R.G.	ROBLE	NATL CTR FOR ATOMS RES
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - A.F.	MAGY	U OF MICHIGAN
OI - D.	REES	U COLLEGE LONDON

**BRIEF DESCRIPTION**

THE FABRY-PEROT INTERFEROMETER (FPI) IS A HIGH RESOLUTION INSTRUMENT DESIGNED TO MEASURE THE DRIFT AND TEMPERATURE OF NEUTRAL AND IONIC ATOMIC OXYGEN USING THE DOPPLER TECHNIQUE. ZENITH ANGLE SCANNING PROVIDES WIND DETERMINATIONS AT VARIOUS ALTITUDES BELOW THE SPACECRAFT. THE INFORMATION OBTAINED FROM THIS INVESTIGATION IS USED TO STUDY THE DYNAMIC RESPONSE OF THE THERMOSPHERE TO THE ENERGY SOURCES CAUSED BY MAGNETOSPHERIC ELECTRIC FIELDS AND THE ABSORPTION OF SOLAR ULTRAVIOLET LIGHT IN THE THERMOSPHERE. THE INSTRUMENT IS BASED ON THE VISIBLE AIRGLOW EXPERIMENT (VAE) USED IN THE AE PROGRAM. THE ADDITION OF A SCANNING MIRROR, THE FABRY-PEROT ETALON, AN IMAGE PLANE DETECTOR, AND A CALIBRATION LAMP ARE THE PRINCIPAL DIFFERENCES. FOUR BAND-PASS FILTERS ISOLATE LINES AT 5577 Å, 6300 Å, 7319-7330 Å, AND THE SPECTRAL CALIBRATION LINE. THE BASIC SENSOR IS A FLAT-PLATE FABRY-PEROT INTERFEROMETER, WITH A PLATE DIAMETER OF 3.1 CM AND A PLATE SEPARATION OF 1.27 CM. BECAUSE THE FABRY-PEROT PROVIDES ALL THE NEEDED SPECTRAL INFORMATION IN A CONCENTRIC RING PATTERN ON AN IMAGE PLANE, A SINGLE PHOTON-COUNTING IMAGE DETECTOR IS USED TO ACQUIRE SIMULTANEOUS SPECTRAL INFORMATION. THIS DETECTOR CONSISTS OF A PHOTOCATHODE MICROCHANNEL-PLATE GAIN STAGE AND CONCENTRIC RING ANODES MATCHED TO THE FABRY-PEROT OUTPUT IMAGE. THE RESOLUTION IS 0.0196 Å PER RING, ALLOWING ABSOLUTE MEASUREMENT ACCURACY OF ABOUT 10 M/S FOR THE DRIFT VELOCITY OF NEUTRAL ATOMIC OXYGEN. THE HEIGHT RESOLUTION IS 1 KM.

----- DYNAMICS EXPLORER-B, HEELIS-----

INVESTIGATION NAME- ION DRIFT METER

NSSDC ID- DE-B -06

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - R.A. HEELIS	U OF TEXAS, DALLAS
OI - W.B. HANSON	U OF TEXAS, DALLAS
OI - D.R. ZUCCARO	U OF TEXAS, DALLAS
OI - C.R. LIPPENCOTT	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

THE ION DRIFT METER (IDM) MEASURES THE BULK MOTIONS OF VECTOR. THE MEASURED PARAMETERS, HORIZONTAL AND VERTICAL ION DRIFT VELOCITIES, HAVE A NOMINAL RANGE OF PLUS OR MINUS 4 KM/S. THE ACCURACY OF THE MEASUREMENT IS DEPENDENT ON S/C ATTITUDE DETERMINATION. THIS INVESTIGATION YIELDS INFORMATION ON: (1) THE ION CONVECTION (ELECTRIC FIELD) PATTERN IN THE AURORAL AND LINES WITHIN THE PLASMAPAUSE, WHICH DETERMINES WHETHER THIS MOTION IS SIMPLY A BREATHING OF THE PHOTONOSPHERE, A REFILLING OF THIS REGION AFTER A STORM, OR AN INTERHEMISPHERIC TRANSPORT OF PLASMA; (2) THE THERMAL ION CONTRIBUTION TO FIELD-ALIGNED ELECTRIC CURRENTS; (3) VELOCITY FIELDS ASSOCIATED WITH SMALL-SCALE PHENOMENA THAT ARE IMPORTANT AT BOTH LOW AND HIGH LATITUDES; (4) THE MAGNITUDE AND VARIATION OF THE TOTAL CONCENTRATION ALONG THE ORBITAL FLIGHT PATH. THE ION DRIFT METER MEASURES THE PLASMA MOTION PARALLEL TO THE SENSOR FACE BY USING A GRIDDED COLLIMATOR AND MULTIPLE COLLECTORS TO DETERMINE THE DIRECTION OF ARRIVAL OF THE PLASMA. THE INSTRUMENT GEOMETRY IS VERY SIMILAR TO THAT USED ON THE AE-C SATELLITE. TWO LOGARITHMIC AMPLIFIERS AND ONE LINEAR DIFFERENCE AMPLIFIER ARE USED WITH THE DRIFT METER. THE LOGARITHMIC AMPLIFIERS CAN BE CONNECTED TO DIFFERENT PAIRS OF THE COLLECTOR SEGMENTS AND PROVIDE THE INPUT TO THE DIFFERENCE AMPLIFIER. THE OUTPUT FROM CURRENTS TO THE PAIRS OF COLLECTOR SEGMENTS. IF THE DIRECTION OF ARRIVAL OF THE PLASMA IS NOT NORMAL TO THE SENSOR FACE, THEN THE ION CURRENT IS ASYMMETRICALLY DISTRIBUTED OVER THE FOUR COLLECTOR SEGMENTS. IN THE ABSENCE OF ANY EXTERNAL ELECTRIC FIELDS OR NEUTRAL WINDS, THE ANGLE OF ARRIVAL OF THE PLASMA AT THE SENSOR FACE IS DETERMINED SOLELY BY THE ATTITUDE OF THE SPACECRAFT ATTITUDE, VELOCITY, AND THE POSITION OF THE SENSOR ON THE SURFACE ARE ACCURATELY KNOWN, THEN ANY DEVIATION (RECORDED BY THE DRIFT METER) FROM THE EXPECTED ANGLE OF ARRIVAL OF THE PLASMA MAY BE INTERPRETED IN TERMS OF PLASMA MOTION CAUSED BY ELECTRIC FIELDS OR NEUTRAL WINDS. IN ADDITION TO MEASURING THE ANGLE OF ARRIVAL OF THE PLASMA AT THE SENSOR FACE, IT IS POSSIBLE TO MONITOR THE TOTAL ION CONCENTRATION BECAUSE THE SUM OF THE CURRENTS TO THE TWO LOGARITHMIC AMPLIFIERS IS VERY NEARLY PROPORTIONAL TO THIS QUANTITY.

----- DYNAMICS EXPLORER-B, HOFFMAN-----

INVESTIGATION NAME- LOW ALTITUDE PLASMA INVESTIGATION HIGH ANGULAR RESOLUTION

NSSDC ID- DE-B -13

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - R.A. HOFFMAN	NASA-GSFC
OI - J.D. WINNINGHAM	U OF TEXAS, DALLAS
OI - D.M. KLUMPAR	U OF TEXAS, DALLAS
OI - J.L. BURCH	SOUTHWEST RES INST

BRIEF DESCRIPTION

THIS INVESTIGATION USES THE SUPRATHERMAL PARTICLE DISTRIBUTION FUNCTIONS MEASURED BY BOTH THE HIGH (DE-A-05) AND LOW (DE-B-08) ALTITUDE PLASMA INSTRUMENTS. THE PURPOSES ARE TO: (1) STUDY THE PROPERTIES AND LOCATIONS OF AURORAL ACCELERATION MECHANISMS; (2) DETERMINE THE NATURE AND DISTRIBUTION OF ELECTRIC FIELDS PARALLEL TO THE MAGNETIC FIELD; (3) IDENTIFY THE CHARGE CARRIERS OF THE MAJOR ELECTRIC CURRENT SYSTEMS COUPLING THE MAGNETOSPHERE AND IONOSPHERE; AND (4) DETERMINE RELATIONS BETWEEN THESE QUANTITIES, AND THE CONVECTION ELECTRIC FIELD AND AURORAL LIGHT EMISSION PATTERNS.

----- DYNAMICS EXPLORER-B, HAYWARD-----

INVESTIGATION NAME- ELECTRIC FIELD INVESTIGATIONS

NSSDC ID- DE-B -02

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - N.C. HAYWARD	NASA-GSFC
OI - J.P. HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

THE VECTOR ELECTRIC FIELD INSTRUMENT (VEFI) USES FLIGHT-PROVEN DOUBLE-PROBE TECHNIQUES WITH 20-M BASELINES TO OBTAIN VECTOR MEASUREMENTS OF DC ELECTRIC FIELDS. THIS ELECTRIC FIELD INVESTIGATION PROVIDES THE DATA NECESSARY TO MEET THE FOLLOWING OBJECTIVES: (1) TO OBTAIN ACCURATE AND COMPREHENSIVE TRIAXIAL DC ELECTRIC FIELD MEASUREMENTS AT IONOSPHERIC ALTITUDES IN ORDER TO REFINISH THE BASIC SPATIAL PATTERNS, DEFINE THE LARGE-SCALE TIME HISTORY OF THESE PATTERNS, AND STUDY THE SMALL-SCALE TEMPORAL AND SPATIAL VARIATIONS WITHIN THE OVERALL PATTERNS; (2) TO STUDY THE DEGREE TO WHICH AND IN WHAT REGION THE ELECTRIC FIELD PROJECTS TO THE EQUATORIAL PLANES; (3) TO OBTAIN MEASUREMENTS OF ELF AND LOWER-FREQUENCY IRREGULARITY STRUCTURES; AND (4) TO PERFORM NUMEROUS CORRELATIVE STUDIES. THE INSTRUMENT CONSISTS OF SIX CYLINDRICAL ELEMENTS 11 M LONG AND 20 MM IN DIAMETER. EACH ANTENNA IS INSULATED FROM THE PLASMA EXCEPT FOR THE OUTER 2 M. THE BASELINE, OR DISTANCE BETWEEN THE MIDPOINTS OF THESE 2-M ACTIVE ELEMENTS IS 20 M. THE ANTENNAS ARE INTERLOCKED ALONG THE EDGES TO PREVENT OSCILLATION (CAUSED BY THERMAL PUMPING) AND TO INCREASE THEIR RIGIDITY AGAINST DRAG FORCES. THE BASIC ELECTRONIC SYSTEM IS VERY SIMILAR IN CONCEPT TO THAT USED ON IMP-J AND ISEE-1, BUT MODIFIED FOR A THREE-AXIS MEASUREMENT ON A NONSPINNING SPACECRAFT. AT THE CORE OF THE SYSTEM ARE THE HIGH IMPEDANCE (1.612 OHM) PREAMPLIFIERS WHOSE OUTPUTS ARE ACCURATELY SUBTRACTED AND DIGITIZED (14-BIT A-D CONVERSION FOR SENSITIVITY TO 0.1 MICROWOLT/M) TO MAINTAIN HIGH RESOLUTION FOR SUBSEQUENT REMOVAL OF THE CROSS-PRODUCT OF THE VECTORS V AND B IN DATA PROCESSING. THIS PROVIDES THE BASIC DC MEASUREMENT. OTHER CIRCUITRY IS USED TO AID IN INTERPRETING THE DC DATA AND TO MEASURE RAPID VARIATIONS IN THE SIGNALS DETECTED BY THE ANTENNAS. THE DC ELECTRIC FIELD RANGE IS PLUS OR MINUS 1 MV/M, THE RESOLUTION IS 0.1 MV/M, AND THE VARIATIONAL ELECTRIC FIELD WILL BE MEASURED FROM 4 Hz TO 512 Hz.

----- DYNAMICS EXPLORER-B, MAYR-----

INVESTIGATION NAME- ATMOSPHERIC DYNAMICS AND ENERGETICS INVESTIGATION

NSSDC ID- DE-B -12

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.G. MAYR	NASA-GSFC
OI - G.P. NEWTON	NASA HEADQUARTERS

BRIEF DESCRIPTION

THE PURPOSE OF THIS INVESTIGATION IS TO STUDY THE DYNAMIC RESPONSES OF THE THERMOSPHERE AND IONOSPHERE TO ENERGY DEPOSITION IN THE FORM OF JOULE HEATING, PARTICLE PRECIPITATION, AND MOMENTUM TRANSFER BY ELECTRIC FIELD-GENERATED DRIFTS. THE OBJECTIVE IS TO DETERMINE THE RELATIVE IMPORTANCE OF THE VARIOUS PHENOMENA AND THE CONDITIONS UNDER WHICH ORDERING OCCURS. BECAUSE THE RELATIVE IMPORTANCE OF THE DIFFERENT PROCESSES VARIES WITH GEOMAGNETIC ACTIVITY, BOTH GEOMAGNETICALLY QUIET AND DISTURBED CONDITIONS ARE EXAMINED. USING THEORETICAL MODELS AS TOOLS, THE PRINCIPAL GOAL IS TO QUANTITATIVELY ANALYZE THE PHYSICAL PROCESSES INVOLVED IN THE ENERGY COUPLING BETWEEN THE MAGNETOSPHERE AND THE THERMOSPHERE. IN ADDITION TO DATA OBTAINED FROM VARIOUS DE SATELLITE INSTRUMENTS, THE INVESTIGATION USES GROUND-BASED CORRELATIVE MEASUREMENTS.

----- DYNAMICS EXPLORER-B, NAGY-----

INVESTIGATION NAME- MAGNETOSPHERIC ENERGY COUPLING TO THE ATMOSPHERE INVESTIGATION

NSSDC ID- DE-B -10

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - A.F. NAGY	U OF MICHIGAN
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BRIEF DESCRIPTION

THIS INVESTIGATION, USING VARIOUS DATA FROM VARIOUS SPACECRAFT INSTRUMENTS, STUDIES: (1) GLOBAL THERMOSPHERIC DYNAMICS (THE EFFECTS OF ENERGY INPUT TO THE THERMOSPHERE FROM THE MAGNETOSPHERE BY CONVECTION, JOULE HEATING, PARTICLE PRECIPITATION AND TIDAL ENERGY); (2) THE CONVECTIVE COUPLING OF THE THERMAL PLASMA BETWEEN THE IONOSPHERE AND MAGNETOSPHERE; AND (3) THE ENERGY-LOSS MECHANISMS OF IONOSPHERIC PHOTOELECTRONS IN THE PLASMAPAUSE.

----- DYNAMICS EXPLORER-B, ROBLE-----

INVESTIGATION NAME- NEUTRAL-PLASMA INTERACTIONS INVESTIGATION

NSSDC ID- DE-B -11

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICSPERSONNEL  
PI - R.G. ROBBLE

NATL CTR FOR ATOMS RES

## BRIEF DESCRIPTION

THIS INVESTIGATION, USING DATA FROM VARIOUS SPACECRAFT INSTRUMENTS, STUDIES THE LARGE-SCALE NEUTRAL-PLASMA INTERACTIONS IN THE THERMOSPHERE CAUSED BY MAGNETOSPHERIC-IONOSPHERIC AND THERMOSPHERIC COUPLING PROCESSES. MODELS ARE USED TO PROVIDE A THEORETICAL FRAMEWORK IN WHICH CERTAIN IMPORTANT IONOSPHERIC AND ATMOSPHERIC PROPERTIES NEEDED FOR COUPLING PROCESSES (SUCH AS THE PEDERSEN AND HALL CONDUCTIVITIES) MAY BE CONSISTENTLY CALCULATED USING SATELLITE DATA MEASURED AT A GIVEN HEIGHT. THESE MODELS ARE USED TO CALCULATE VERTICAL PROFILES OF IONOSPHERIC PROPERTIES THAT ARE USEFUL FOR COMPARISON WITH INCOHERENT SCATTER RADAR MEASUREMENTS AND OTHER GROUND-BASED SUPPORTING DATA. THE DATA ARE USED TO IDENTIFY AND EVALUATE THE NEUTRAL THERMOSPHERIC HEAT AND MOMENTUM SOURCES, AND TO DETERMINE THE EFFECTIVENESS OF HIGH LATITUDE DYNAMIC PROCESSES IN CONTROLLING THE GLOBAL THERMOSPHERIC CIRCULATION AND THERMAL STRUCTURE.

PARTICLES, AND AURORAL IMAGES OBTAINED FROM INVESTIGATION DE-A-03. THE SENSOR IS A THREE-AXIS FLUIGATE MAGNETOMETER WITH DIGITAL COMPENSATION OF THE AMBIENT FIELD IN PRECISE 0.03 NT (0.03 GAMMAS) INCREMENTS. THE INSTRUMENT INCORPORATES ITS OWN 12-BIT A-D CONVERTER, 4-BIT DIGITAL COMPENSATION REGISTER FOR EACH AXIS, AND A SYSTEM CONTROL TO GENERATE A 48-BIT DATA WORD CONSISTING OF A 16-BIT REPRESENTATION OF THE FIELD MEASURED ALONG EACH OF THREE MAGNETOMETER AXES. TRACK AND HOLD MODULES ARE USED TO OBTAIN SIMULTANEOUS SAMPLES ON ALL THREE AXES. THE INSTRUMENT BANDWIDTH IS 25 Hz. THE ANALOG RANGE IS PLUS OR MINUS 60,000 NT, THE ACCURACY IS 4 NT, AND THE RESOLUTION IS 1.5 NT.

----- DYNAMICS EXPLORER-B, WINNINGHAM -----

INVESTIGATION NAME- LOW ALTITUDE PLASMA INSTRUMENT

NSSDC ID- DE-B -08

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PARTICLES AND FIELDS  
IONOSPHERESPERSONNEL  
PI - J.D. WINNINGHAM  
OI - D.M. KLUMPAR  
OI - R.A. HOFFMAN  
OI - J.L. BURCHU OF TEXAS, DALLAS  
U OF TEXAS, DALLAS  
NASA-GSFC  
SOUTHWEST RES INST

## BRIEF DESCRIPTION

THE LOW ALTITUDE PLASMA INSTRUMENT (LAPI) PROVIDES HIGH-RESOLUTION MEASUREMENTS OF POSITIVE IONS AND ELECTRONS FROM 5 EV TO 30 KEV, WITH AN ENERGY RESOLUTION DELTA E/E EQUAL TO 32 PERCENT. DATA FROM THIS INVESTIGATION AND SUPPORTING MEASUREMENTS ARE USED TO STUDY: (1) THE IDENTIFICATION AND INTENSITIES OF BIRKELAND CURRENTS; (2) AURORAL PARTICLE SOURCE REGIONS AND ACCELERATION MECHANISMS; (3) THE EXISTENCE AND ROLE OF E PARALLEL TO B; (4) SOURCES AND EFFECTS OF POLAR CAP PARTICLE FLUXES; (5) THE TRANSPORT OF PLASMA WITHIN AND THROUGH THE MAGNETOSPHERIC CUSPS; (6) DYNAMIC CONFIGURATIONS OF HIGH LATITUDE FLUX TUBES; (7) LOSS CONE EFFECTS OF WAVE-PARTICLE INTERACTIONS; (8) HOT-COLD PLASMA INTERACTIONS; (9) IONOSPHERIC EFFECTS OF PARTICLE PRECIPITATION; AND (10) PLASMA CONVECTION AT HIGH ALTITUDES. THE INSTRUMENT CONTAINS AN ARRAY OF 15 ELECTROSTATIC ANALYZERS OF THE ISIS 2 TYPE, EACH WITH AN ELECTRON CHANNEL AND MOST WITH AN ION CHANNEL, IN ORDER TO OBTAIN DETAILED PITCH ANGLE DISTRIBUTIONS AS A FUNCTION OF ENERGY. THE BASIC MODE OF OPERATION PROVIDES A 32-POINT ENERGY SPECTRUM EVERY SECOND FROM EACH SENSOR, BUT THE VOLTAGES ON THE ELECTROSTATIC ANALYZER ARE PROGRAMMABLE TO ALLOW FOR HIGHER TIME RESOLUTION OVER LIMITED PORTIONS OF THE ENERGY SPECTRUM. THE INSTRUMENT IS MOUNTED ON A SIMPLE ONE-AXIS SCAN PLATFORM ORIENTED SO THAT ONE DETECTOR IS ALWAYS MEASURING PARTICLES WITH PITCH ANGLES OF LESS THAN 1 DEG.

\*\*\*\*\* ERBS-A\*\*\*\*\*

SPACECRAFT COMMON NAME- ERBS-A  
ALTERNATE NAMES- AEM-D, EARTH RAD BUDGET SAT

NSSDC ID- ERBS-A

LAUNCH DATE- 11/00/83  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

WEIGHT- 170. KG

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GAPLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 96.6 MIN  
PERIAPSIS- 600. KM ALT  
APOAPSIS- 600. KM ALT  
INCLINATION- 46. DEGPERSONNEL  
MG - D.S. DILLER  
SC - R.A. SCHIFFER  
PM - C.L. WAGNER, JR.  
PS - R. CURRANNASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
THE EARTH RADIATION BUDGET SATELLITE (ERBS) IS A 2-YR MISSION TO GATHER REQUIRED RADIATION BUDGET DATA, AEROSOL DATA, OZONE DATA (RELATED TO THE CHLORINE CHEMISTRY PROCESS), AND TO ASSESS CLIMATE CHANGE AND OZONE DEPLETION. THE EXPERIMENTS ARE THE EARTH RADIATION BUDGET EXPERIMENT (ERBE), THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT II, AND THE HALOGEN OCCULTATION EXPERIMENT (HALOE). THE ERBE WILL BE CARRIED ON TWO TIROS-N SERIES MISSIONS.

----- ERBS-A, BROOME -----

INVESTIGATION NAME- EARTH RADIATION BUDGET INSTRUMENT (ERBI)

INVESTIGATION NAME- MAGNETIC FIELD OBSERVATIONS

NSSDC ID- DE-B -01

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICSPERSONNEL  
PI - M. SUGIURA  
OI - B.G. LEDLEY  
OI - W.H. FARSHING  
OI - L.J. CAHILL, JR.NASA-GSFC  
NASA-GSFC  
NASA-GSFC  
U OF MINNESOTA

BRIEF DESCRIPTION  
A FLUIGATE MAGNETOMETER (PAG-B) SIMILAR TO ONE ON BOARD DE-A (DE-A-01), IS USED TO OBTAIN MAGNETIC FIELD DATA NEEDED TO STUDY THE MAGNETOSPHERE-IONOSPHERE-ATMOSPHERE COUPLING. THE PRIMARY OBJECTIVES OF THIS INVESTIGATION ARE TO MEASURE FIELD-ALIGNED CURRENTS IN THE AURORAL OVAL AND OVER THE POLAR CAP AT TWO DIFFERENT ALTITUDES USING THE TWO SPACECRAFT, AND TO CORRELATE THESE MEASUREMENTS WITH OBSERVATIONS OF ELECTRIC FIELDS, PLASMA WAVES, SUPRATHERMAL PARTICLES, THERMAL

ORIGINAL PAGE IS  
OF POOR QUALITY

NSSDC ID- ERBS-A -01

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - G.C. BROOME  
OI - A.A. RUDRAN

NASA-LARC  
NASA-GSFC

BRIEF DESCRIPTION

THE EARTH RADIATION BUDGET SATELLITE SYSTEM (ERBSS) IS DESIGNED TO MEASURE THE ENERGY EXCHANGE BETWEEN THE EARTH-ATMOSPHERE SYSTEM AND SPACE. THESE MEASUREMENTS ARE IMPORTANT FOR CLIMATE PREDICTION AND IN DEVELOPING STATISTICAL RELATIONSHIPS BETWEEN REGIONAL WEATHER AND RADIATION BUDGET ANOMALIES. THE EARTH RADIATION BUDGET EXPERIMENTS WILL BE FLOWN ON BOTH NOAA AND ERBS SATELLITES TO MEASURE REGIONAL RADIATION BUDGETS AND EQUATOR-TO-POLE GRADIENTS OF NET RADIATION. THE EARTH RADIATION BUDGET INSTRUMENT (ERBI) CONSISTS OF EIGHT CHANNELS DISTRIBUTED WITHIN TWO INSTRUMENT PACKAGES: THE WIDE AND MEDIUM FIELD OF VIEW INSTRUMENT (W/MFOV) AND THE SCANNER INSTRUMENT. THE W/MFOV IS A FIVE CHANNEL RADIOMETER. FOUR CHANNELS ARE PRIMARILY EARTH-VIEWING, BUT UPON COMMAND CAN BE POINTED TOWARD THE SUN FOR PERIODIC CALIBRATION. THE FIFTH CHANNEL IS FIXED FOR CONTINUOUS OBSERVATION OF THE SUN FOR CALIBRATION. TWO OF THE FOUR GIMBALED SENSORS ARE WIDE-ANGLED AND VIEW THE ENTIRE EARTH FROM LIMB TO LIMB, APPROXIMATELY 135 DEG. THESE DETECTORS HAVE BROADBAND SPECTRAL RESPONSES VARYING FROM 0.2 MICROMETERS TO OVER 50 MICROMETERS. CHANNEL 1 MAKES TOTAL RADIATION MEASUREMENTS WHILE CHANNEL 2, WITH ITS FILTER ATTACHED, MAKES MEASUREMENTS OVER THE SHORTWAVE SPECTRAL BAND CHARACTERIZED BY THE SUPRAL-S-W DOME FILTER WHICH CUTS OFF AT 5 MICROMETERS. THE REMAINING TWO GIMBALED SENSORS ARE MEDIUM FIELD OF VIEW CHANNELS WITH AN 88-DEG FIELD OF VIEW, EQUIVALENT TO A TEXAS-SIZE FOOTPRINT. CHANNEL 3 MEASURES TOTAL RADIATION WHILE CHANNEL 4, PLACED UNDER A SUPRAL-S-W DOME, MEASURES THE SHORTWAVE SPECTRAL BAND. THE EARTH-EMITTED LONGWAVE RADIATION COMPONENT IS DETERMINED BY SUBTRACTING THE SHORTWAVE CHANNEL FROM THE TOTAL CHANNEL. THE SOLAR CHANNEL (5) HAS A 10-DEG FIELD OF VIEW MEASURING THE TOTAL SOLAR SPECTRAL RANGE OF THE SUN. THE SCANNER INSTRUMENT IS A SMALL SPATIAL RESOLUTION (FOV EQUALS 3 DEG DIAMETER) SCANNING RADIOMETER CONTAINING THREE SEPARATE CHANNELS (6-7-8). CHANNEL 6 ISOLATES THE SHORTWAVE SPECTRAL INTERVAL (0.2 TO 5 MICROMETERS). CHANNEL 7 MEASURES THE LONGWAVE SPECTRAL REGION (5 TO 50 MICROMETERS), AND CHANNEL 8 (1.6 MICROMETERS) PROVIDES CLOUD IMAGERY TO AID IN ANALYZING CHANNEL 6 AND 7 DATA. ALL THREE SENSORS ARE LOCATED WITHIN A CONTINUOUSLY ROTATING SCAN DRUM WHICH SCANS THE FOV ACROSS TRACK SEQUENTIALLY FROM HORIZON TO HORIZON AND FROM A SPACE VIEW FOR CALIBRATION. ADDITIONAL INFORMATION CAN BE OBTAINED FROM 'SYSTEM CONSIDERATIONS FOR AN EARTH RADIATION BUDGET SCANNING RADIOMETER,' AND 'THE EARTH RADIATION BUDGET SATELLITE SYSTEM OF THE EARLY 1980'S.'

----- ERBS-A: MCCORMICK -----

INVESTIGATION NAME- STRATOSPHERIC AEROSOL AND GAS (SAGE)

NSSDC ID- ERBS-A -02

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - M.P. MCCORMICK  
OI - J.E. PLEASANTS

NASA-LARC  
NASA-LARC

BRIEF DESCRIPTION

THE SAGE SENSOR IS A MULTI-SPECTRAL CHANNEL RADIOMETER WHICH MEASURES THE EXTINCTION OF SOLAR RADIATION INTENSITY DURING SOLAR OCCULTATION. AS THE SPACECRAFT EMERGES FROM THE EARTH'S SHADOW DURING EACH ORBIT, THE SENSOR WILL ACQUIRE THE SUN AND MEASURE THE SOLAR INTENSITY IN WAVELENGTH BANDS CENTERED BETWEEN 0.385 AND 1.0 MICROMETERS AS IT SCANS THE SUN VERTICALLY. AS THE SPACECRAFT CONTINUES IN ORBIT, THE LINE OF SIGHT FROM THE SPACECRAFT TO THE RISING SUN WILL SCAN THE EARTH'S ATMOSPHERE, RESULTING IN A MEASUREMENT OF THE ATTENUATED SOLAR INTENSITY AT DIFFERENT ATMOSPHERIC LAYERS. THE PROCEDURE WILL THEN BE REPEATED IN A REVERSE SENSE DURING SPACECRAFT SUNSET. EACH SUNRISE AND SUNSET EVENT WILL BE MONITORED FROM THE TOP OF THE CLOUDS TO APPROXIMATELY 150 KM ABOVE THE EARTH'S SURFACE. THE SENSOR WILL HAVE AN INSTANTANEOUS FIELD OF VIEW OF APPROXIMATELY 0.5 KM MEASURED AT THE HORIZON FOR A 600-KM ORBIT. THE DYNAMIC RANGE OF EACH RADIOMETRIC CHANNEL IS APPROXIMATELY 4000 AND THE UNCERTAINTY IN ANY RADIOMETRIC MEASUREMENT IS SPECIFIED TO BE LESS THAN 0.2 PERCENT OF THE UNATTENUATED SOLAR INTENSITY (THE SENSOR IS PARTIALLY SELF-CALIBRATING IN THAT A MEASUREMENT OF THE UNATTENUATED SOLAR INTENSITY IS MADE PRIOR TO EACH SPACECRAFT SUNSET AND FOLLOWING EACH SPACECRAFT SUNRISE). FURTHERMORE, ZERO INTENSITY LEVELS ARE REACHED EVERY TIME THE ELEVATION MIRROR SCANS OFF THE SUN. THE INSTRUMENT MODULE CONSISTS OF OPTICAL AND ELECTRONIC SUBASSEMBLIES MOUNTED SIDE BY SIDE. THE OPTICAL SUBASSEMBLY CONSISTS OF A FLAT SCANNING MIRROR, CASSEGRAIN OPTICS, AND A DETECTOR PACKAGE. THE ENTIRE OPTICAL SUBASSEMBLY IS GIMBALED IN AZIMUTH. THE AZIMUTH SERVO EMPLOYS SUN SENSORS DRIVEN TO NULL ON THE CENTER OF THE SUN TO A TOLERANCE OF PLUS OR MINUS 1 ARC MIN. AT THE BEGINNING OF A SUNRISE OR SUNSET EVENT, THE INSTRUMENT SLEWS IN AZIMUTH TO A POSITION TO ACQUIRE THE SUN. UPON ACQUISITION IN AZIMUTH, THE MIRROR SERVO SCANS IN ELEVATION UNTIL THE SUN IS ACQUIRED. THE

SCAN RANGE IS THEN REDUCED TO SCANNING BACK AND FORTH ACROSS THE SOLAR IMAGE ONLY. THE SOLAR INPUT IS REFLECTED FROM THE SCAN MIRROR THROUGH THE CASSEGRAIN TELESCOPE WHICH PRODUCES A SOLAR IMAGE UPON THE SCIENCE DETECTOR APERTURE. THIS IMAGE IS SCANNED ACROSS THE APERTURE BY THE MOTION OF THE SCAN MIRROR. THE RADIATION THROUGH THE APERTURE IS DISPERSED AND THE BEAMS REPRESENTING THE WAVELENGTH BANDS ARE THEN COLLECTED AND APPLIED TO SILICON PIN DIODE DETECTORS. THE OUTPUTS OF THE DETECTORS ARE FED TO SIGNAL CONDITIONING AMPLIFIERS WHOSE OUTPUTS GO TO THE PCP ENCODER. THE PCP ENCODER MULTIPLEXES AND DIGITIZES THE SIGNALS AND THEN TRANSFERS THE DIGITAL DATA TO THE ERBS DATA SYSTEM. THE RADIOMETRIC DATA FOR EACH WAVELENGTH CHANNEL WILL BE SAMPLED 64 TIMES PER S OR APPROXIMATELY 4 TIMES PER KM OF TANGENT ALTITUDE, AND DIGITIZED TO 12 BITS; THESE DATA PLUS SCIENCE SUPPORTING DATA AND INSTRUMENT MODULE HOUSEKEEPING DATA TOTAL APPROXIMATELY 6 KBPS.

----- ERBS-A: RUSSELL, 3RD -----

INVESTIGATION NAME- HALOGEN OCCULTATION (HALOE)

NSSDC ID- ERBS-A -03

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - J.M. RUSSELL, 3RD  
OI - C.W. COFFEE, JR.

NASA-LARC  
NASA-LARC

BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF AN OPTICS UNIT, SUPPORTED ON A TWO-AXIS GIMBAL, AND AN ELECTRONICS UNIT. THE OPTICS UNIT CONTAINS THE OPTICS, MODULATORS, DETECTORS, AND PREAMPS FOR THE GAS DETECTION CHANNELS AND RADIOMETER CHANNELS. THE GIMBAL ASSEMBLY PROVIDES AZIMUTH AND ELEVATION ROTATION OF THE OPTICS UNIT WITH PLUS OR MINUS 185 DEG AZIMUTH RANGE AND A 38 DEG RANGE OF ELEVATION ANGLE CONTROL, AND IS CONTROLLED BY COARSE AND FINE SUN SENSORS INCLUDED IN THE OPTICS UNIT. THE ELECTRONICS UNIT PROVIDES SIGNAL PROCESSING, MOTOR DRIVES, SEQUENCE TIMING, MODE CONTROL, POWER CONDITIONING, AND DATA HANDLING. A 16-CM-DIAMETER REFLECTIVE CASSEGRAIN TELESCOPE COLLECTS ENERGY FOR THE GAS DETECTION CHANNELS. THE INSTANTANEOUS FIELD OF VIEW (IFOV) IS DETERMINED BY A FIELD STOP AT THE FOCAL POINT OF THE TELESCOPE, AND THE ENERGY IS MODULATED BY A CHOPPER SIMILAR TO THAT OF THE MONITORING AIR POLLUTION FROM SATELLITES (MAPS) INSTRUMENT. A HOT REFERENCE BLACKBODY SOURCE IS USED TO APPROXIMATELY BALANCE THE SOLAR ENERGY LEVELS WHEN THE CHOPPER DISC IS IN THE CLOSED (REFLECTIVE) POSITION. AN OPTICAL SIGNAL PROVIDED AND PROCESSED IN A SIMILAR MANNER AS THE MAPS INSTRUMENT IS USED TO MAINTAIN GAIN BALANCE OF THE DETECTOR BRANCHES. THE OPTICAL BEAM IS SEPARATED BY BEAMSPARTERS INTO THE GAS CORRELATION AND RADIOMETER MODULES. THE OUTPUT SIGNALS FROM THE GAS CORRELATION MODULES ARE SENT TO THE SIGNAL PROCESSOR, WHICH IS SIMILAR TO THE MAPS SIGNAL PROCESSOR DESIGN. THE OUTPUT SIGNALS FROM THE RADIOMETER MODULES ARE SENT TO A STANDARD RADIOMETER SIGNAL PROCESSOR. A STEPPER DRIVEN CALIBRATION WHEEL IS PROVIDED IN FRONT OF THE TELESCOPE FIELD STOP TO PROVIDE MEASUREMENTS OF GAS RESPONSE, RADIOMETRIC CALIBRATION, AND INSTRUMENT BALANCE, USING THE EXOSPHERIC SUN AS AN ENERGY SOURCE. THE CALIBRATION WHEEL CONTAINS THREE GAS CELLS AND A NEUTRAL DENSITY FILTER FOR THESE MEASUREMENTS. THE SIGNAL PROCESSING AND MOTOR DRIVE ELECTRONICS ARE SIMILAR TO THOSE OF THE MAPS INSTRUMENT. THE REMAINING ELECTRONICS ARE CONVENTIONAL AND STRAIGHT FORWARD WITH NO CRITICAL DESIGN AREAS. THE PROPOSED GIMBAL ASSEMBLY IS A STEPPER DRIVEN, TWO-AXIS (AZIMUTH, ELEVATION) ASSEMBLY THAT SUPPORTS THE OPTICS UNIT NEAR THE CENTER OF GRAVITY OF THE INSTRUMENT. THE GIMBALS PROVIDE A CAPABILITY FOR FINE TRACKING. TRACKING CONTROL SIGNALS FOR THE GIMBALS ARE DERIVED FROM THE SUN SENSORS. THE FINE SUN SENSOR IS A TWO-AXIS DIGITAL SENSOR USING RETICON LINEAR ARRAY DETECTORS WITH 256 ELEMENTS PER AXIS GIVING .33 ARC MIN RESOLUTION. THE COARSE SUN SENSOR IS AN ANALOG TWO-AXIS DEVICE SIMILAR TO AN EXISTING ADCOLE SUN SENSOR. THE COARSE SENSOR PROVIDES SUN ACQUISITION SIGNALS OVER A PLUS OR MINUS 10 DEG FOV.

\*\*\*\*\* EUVE \*\*\*\*\*

SPACECRAFT COMMON NAME- EUVE

ALTERNATE NAMES- EXTREME UV EXPLORER, BERKSAT

NSSDC ID- EUVE

LAUNCH DATE- 10/00/85

LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

LAUNCH VEHICLE- SHUTTLE

Sponsoring Country/Agency  
United States

NASA-OSS

Planned Orbit Parameters

Orbit Type- GEOCENTRIC

Orbit Period- 95.0 MIN

Periapsis- 550. KM ALT

Inclination- 28.5 DEG

Apoapsis- 550. KM ALT

**PERSONNEL**

MG - L.	DONBEY	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - S.E.	WILLIS	NASA-GSFC
PS - C.S.	BOWTER	U OF CALIF., BERKELEY

**BRIEF DESCRIPTION**

EXTREME ULTRAVIOLET EXPLORER (EUVE) IS A DOME-SHAPED SPINNING SPACECRAFT DESIGNED TO ROTATE ABOUT THE EARTH/SUN LINE. THE DIRECTION OF THE SPIN AXIS IS ALTERED THROUGH MAGNETIC TORQUING. THE SPACECRAFT OBJECTIVE IS TO CARRY OUT A FULL-SKY SURVEY IN THE EXTREME ULTRAVIOLET RANGE OF THE SPECTRUM BETWEEN 7.5 AND 55 NM, FOR PURPOSES OF DISCOVERING AND STUDYING ULTRAVIOLET SOURCES RADIATING IN THIS REGION AND TO ANALYZE EFFECTS ON THE RADIATION FROM THESE SOURCES CAUSED BY THE INTERSTELLAR MEDIUM.

----- EUVE-BOWTER-----

**INVESTIGATION NAME-** EXTREME ULTRAVIOLET FULL SKY SURVEY

**NSSDC ID-** EUVE -01      **INVESTIGATIVE PROGRAM**  
CODE SC

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY

**PERSONNEL**

PI - C.S.	BOWTER	U OF CALIF., BERKELEY
OI - W.	CASH, JR.	U OF CALIF., BERKELEY
OI - F.	PARESE	U OF CALIF., BERKELEY

**BRIEF DESCRIPTION**

THIS INVESTIGATION IS DESIGNED TO PERFORM A FULL-SKY SURVEY, SEARCHING FOR EXTREME ULTRAVIOLET (EUV) SOURCES. THE INSTRUMENT PACKAGE CONTAINS FOUR WOLTER-SCHWARZSCHILD GRAZING INCIDENCE TELESCOPES (WITH EUV THIN-FILM FILTERS) TO COLLECT AND ISOLATE RADIATION. THE DETECTOR SYSTEM IS A RESISTOR ANODE IMAGE CONVERTER (RANICON) CONSISTING OF A MICROCHANNEL PLATE, A RESISTOR, AND DETECTOR AMPLIFIERS DESIGNED TO PRODUCE IMAGES OF SKY FIELDS IN SELECTED WAVELENGTH RANGES. THREE TELESCOPES ARE DESIGNED TO OPERATE AT RIGHT ANGLES TO THE SPIN AXIS AND TO CARRY OUT THE SKY SURVEY, OBSERVING IN THE WAVELENGTH RANGES 7.5 - 18 NM, 16 - 32 NM, AND 39 - 55 NM. THE FOURTH TELESCOPE OPERATES AT APPROXIMATELY 10 DEG FROM THE SPIN AXIS, IN THE WAVELENGTH RANGE 15 - 35 NM, AND IS DESIGNED TO OBSERVE SELECTED INTERESTING OBJECTS.

\*\*\*\*\* EXOS-C \*\*\*\*\*

**SPACECRAFT COMMON NAME-** EXOS-C  
**ALTERNATE NAMES-** EXOSPHERIC SAT. C

**NSSDC ID-** EXOS-C

**LAUNCH DATE-** 1982  
**LAUNCH SITE-** KAGOSHIMA, JAPAN  
**LAUNCH VEHICLE-** H-45

**WEIGHT-** 100. KG

**SPONSORING COUNTRY/AGENCY**  
JAPAN      ISAS

**PLANNED ORBIT PARAMETERS**

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 94.5 MIN  
PERIAPSIS- 500. KM ALT

INCLINATION- 90. DEG  
APOAPSIS- 500. KM ALT

**PERSONNEL**

PM - M.

ODA

U OF TOKYO

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS SPACECRAFT IS TO MONITOR CHARGED PARTICLES AND X-RAY, GAMMA-RAY, UV, AND IR RADIATION FROM THE SUN AND GALAXIES. THE SPACECRAFT IS PUT INTO A CIRCULAR ORBIT OF 500 KM ALTITUDE AND IS CAPABLE OF PRECISE ATTITUDE CONTROL. FIVE DETECTOR SYSTEMS ARE USED TO ATTAIN THE GOALS OF THIS MISSION -- X-RAY TELESCOPES, A GAMMA-RAY TELESCOPE, A UV TELESCOPE, AN IR TELESCOPE, AND ENERGETIC PARTICLE DETECTORS. ADDITIONAL INFORMATION HAS BEEN REQUESTED FROM ODA (3/79) BUT NOT YET RECEIVED.

----- EXOS-C, UNKNOWN-----

**INVESTIGATION NAME-** X-RAY AND GAMMA-RAY ASTRONOMICAL TELESCOPES

**NSSDC ID-** EXOS-C -01      **INVESTIGATIVE PROGRAM**  
SCIENTIFIC SATELLITE

**INVESTIGATION DISCIPLINE(S)**  
X-RAY ASTRONOMY  
GAMMA-RAY ASTRONOMY

**PERSONNEL**  
PI - UNKNOWN

**BRIEF DESCRIPTION**

THIS EXPERIMENT OBSERVES ASTRONOMICAL SOURCES WITH X-RAY AND GAMMA-RAY TELESCOPES. ADDITIONAL INFORMATION HAS BEEN REQUESTED FROM ODA (3/79) BUT NOT YET RECEIVED.

----- EXOS-C, UNKNOWN-----

**INVESTIGATION NAME-** ULTRAVIOLET TELESCOPE

**NSSDC ID-** EXCS-C -02      **INVESTIGATIVE PROGRAM**  
SCIENTIFIC SATELLITE

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY

**PERSONNEL**  
PI - UNKNOWN

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS USED TO OBSERVE ASTRONOMICAL OBJECTS IN THE UV REGION OF THE SPECTRUM. ADDITIONAL INFORMATION HAS BEEN REQUESTED FROM ODA (3/79) BUT NOT YET RECEIVED.

----- EXOS-C, UNKNOWN-----

**INVESTIGATION NAME-** INFRARED TELESCOPE

**NSSPC ID-** EXOS-C -03      **INVEST. PROGRAM**  
SCIENTIFIC SATELLITE

**INVESTIGATION DISCIPLINE(S)**  
ASTRONOMY

**PERSONNEL**  
PI - UNKNOWN

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS USED TO OBSERVE ASTRONOMICAL OBJECTS IN THE INFRARED REGION OF THE SPECTRUM. ADDITIONAL INFORMATION HAS BEEN REQUESTED FROM ODA (3/79) BUT NOT YET RECEIVED.

----- EXOS-C, UNKNOWN-----

**INVESTIGATION NAME-** ENERGETIC PARTICLES

**NSSDC ID-** EXOS-C -04      **INVESTIGATIVE PROGRAM**  
SCIENTIFIC SATELLITE

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
COSMIC RAYS

**PERSONNEL**  
PI - UNKNOWN

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT IS TO MEASURE ENERGETIC CHARGED PARTICLES OF BOTH SOLAR AND GALACTIC ORIGIN. ADDITIONAL INFORMATION HAS BEEN REQUESTED FROM ODA (3/79) BUT NOT YET RECEIVED.

\*\*\*\*\* EXOSAT \*\*\*\*\*

**SPACECRAFT COMMON NAME-** EXOSAT  
**ALTERNATE NAMES-** HI.ECCEN LUN OCCULT.SAT., EUROPEAN X-RAY OBS S HELOS

**NSSDC ID-** EXOSAT

**LAUNCH DATE-** 11/00/81  
**LAUNCH SITE-** KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
**LAUNCH VEHICLE-** ARIANE

**SPONSORING COUNTRY/AGENCY**  
INTERNATIONAL      ESA

**PLANNED ORBIT PARAMETERS**  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 5767. MIN  
PERIAPSIS- 300. KM ALT

INCLINATION- 70. DEG  
APOAPSIS- 200000. KM ALT

**PERSONNEL**

PR - G.	ALTMANN	ESA-ESTEC
PS - R.D.	ANDRESEN	ESA-ESTEC
PS - A.	PEACOCK	ESA-ESTEC

**BRIEF DESCRIPTION**

THE SCIENTIFIC MISSION OF THE EUROPEAN X-RAY OBSERVATORY SATELLITE (EXOSAT) IS TO MEASURE THE POSITION, STRUCTURAL FEATURES AND SPECTRAL AND TEMPORAL CHARACTERISTICS OF COSMIC X-RAY SOURCES IN THE RANGE FROM APPROXIMATELY 0.1 KEV TO 50 KEV. EXOSAT USES TWO OPERATIONAL MODES; (A) THE OCCULTATION MODE, FOR THE PRECISE DETERMINATION AND IDENTIFICATION OF SOURCES AND THE OBSERVATION OF STRUCTURAL FEATURES, USING PRIMARILY THE MOON OR THE EARTH AS THE OCCULTING BODY, AND (B) THE ARBITRARY POINTING MODE FOR THE STUDY OF THE TEMPORAL AND SPECTRAL VARIABILITY OF SOURCES OVER LONG UNINTERRUPTED TIME INTERVALS AND THE MAPPING OF LOW ENERGY SOURCES. THE OBSERVATORY, PLACED IN A HIGHLY ECCENTRIC ORBIT WITH ITS APOGEE AT 200,000 KM AND AT A HIGH LATITUDE, IS CAPABLE OF OBSERVING LUNAR OCCULTATIONS OVER 20 PERCENT OF THE CELESTIAL SPHERE WITHIN A YEAR. THE POSITIONAL ACCURACY OF BRIGHT SOURCES (.67, 1.0E-2 PHOTONS/50 CM<sup>-2</sup> IN THE RANGE GREATER THAN 1.5 KEV) IS

LIMITED TO ABOUT 1 ARC-S BY THE INACCURACY OF MEASUREMENT OF THE POSITION OF THE SATELLITE AND THE UNCERTAINTY OF THE TOPOGRAPHY OF THE LUNAR LIMB. FOR WEAKER SOURCES, THE ACCURACY IS LIMITED BY STATISTICS, I.E., THE TOTAL NUMBER OF X-RAY QUANTA RECEIVED DURING THE TIME OF THE CORRESPONDING ANGULAR DISPLACEMENT OF THE MOON. WHEN NOT ENGAGED IN OCCULTATION OBSERVATIONS, THE OBSERVATORY CAN VIEW THE SKY UNINTERRUPTEDLY IN ANY CHOSEN DIRECTION (EXCEPT 60 DEG AROUND THE SOLAR DIRECTION) FOR AS LONG AS THE ORBITAL PERIOD ABOVE THE VAN ALLEN BELTS (APPROXIMATELY 80 KM), WITH ACCURATE TIMEKEEPING ON BOARD, AND WITH THIS CAPABILITY OF LONG CONTINUOUS OBSERVATION, EXOSAT CAN DETERMINE REGULAR AND IRREGULAR VARIATIONS OF THE INTENSITY OF X-RAY SOURCES ON A TIME SCALE RANGING FROM TENS OF MICROSECONDS TO TENS OF HOURS. THE TRIAXIAL STABILIZED SPACECRAFT IS A CYLINDER WITH A DIAMETER OF 192 CM AND A HEIGHT OF 117 CM. A ROTATABLE SOLAR ARRAY WITH AN AREA OF 3.50 M<sup>2</sup> IS MOUNTED ON TOP OF THE SPACECRAFT. THE STAR TRACKERS ARE MOUNTED ON THE OPTICAL BENCHES OF THE TWO IMAGING TELESCOPES TO FACILITATE ALIGNMENT AND STABILITY. IN THE OCCULTATION AND ARBITRARY POINTING MODES, THE OBSERVATORY IS ABLE TO VIEW ALL OF THE CELESTIAL SPHERE EXCLUDING A CONE OF 19 AND 40 DEG HALF ANGLE CENTERED ON THE SUN, RESPECTIVELY. CONSUMABLES ARE DIMENSIONED TO ENABLE SOME 100 ORBITAL MANEUVERS FOR LUNAR OCCULTATION TO BE UNDERTAKEN AND OVER 2000 TARGETS TO BE OBSERVED. THE SCIENTIFIC PAYLOAD IS FUNDED BY ESA AND ITS DEVELOPMENT MANAGED BY ESA. USE OF THE OBSERVATORY IS OPEN TO THE SCIENTIFIC COMMUNITY FOLLOWING SELECTION OF OBSERVATIONAL PROPOSALS.

----- EXOSAT, BOYD -----

#### INVESTIGATION NAME- LOW-ENERGY X-RAY IMAGING TELESCOPES

NSSDC ID- EXOSAT -02      INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

#### PERSONNEL

TL - R.L.F. BOYD	U COLLEGE LONDON
TR - P.W. SANFORD	U COLLEGE LONDON
TR - D.N. SWANBERG	U OF LEIDEN
TR - J.A.M. BLECKER	U OF LEIDEN
TR - C. DE JAGER	U OF Utrecht
TR - A.C. BRINKMAN	U OF Utrecht

#### BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF TWO IDENTICAL IMAGING TELESCOPES MADE BY SETS OF TWO NESTED GRAZING-INCIDENCE PARABOLIC/HYPERBOLIC REFLECTORS WITH A FOCAL-PLANE ASSEMBLY INCORPORATING A GAS-FLOW POSITION-SENSITIVE PROPORTIONAL COUNTER AND A CHANNEL-MULTIPLIER ARRAY, COVERING THE ENERGY RANGE FROM THE EUV TO 2.5 KEV, WHICH IS LIMITED BY THE REFLECTING OPTICS. AT THE EXIT PLANE OF THE MIRROR A TRANSMISSION GRATING IS LOCATED FOR SPECTROSCOPIC MEASUREMENTS.

----- EXOSAT, TAYLOR -----

#### INVESTIGATION NAME- GAS SCINTILLATION X-RAY SPECTROMETER

NSSDC ID- EXOSAT -03      INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

#### PERSONNEL

TL - B.G. TAYLOR	ESA-ESTEC
TR - R.D. ANDRESEN	ESA-ESTEC
TR - R.L.F. BOYD	U COLLEGE LONDON
TR - P.W. SANFORD	U COLLEGE LONDON
TR - L. SCARSI	U OF PALERMO
TR - S. SALEMI	U OF PALERMO
TR - G. BOELLA	U OF MILAN
TR - G. VILLA	U OF MILAN
TR - A. PEACOCK	ESA-ESTEC

#### BRIEF DESCRIPTION

A GAS SCINTILLATION PROPORTIONAL COUNTER SPECTROMETER IS USED TO STUDY DETAILED SPECTRAL FEATURES IN THE ENERGY RANGE FROM 2.5 TO 50 KEV. THE DEVICE HAS AN EFFECTIVE AREA OF 250 SQ CM AND AN ENERGY RESOLUTION OF BETTER THAN 10 PERCENT AT 6 KEV. THE COUNTER WINDOW IS A 400-MICRONETRE BERYLLIUM FOIL AND THE GAS FILLING IS 70 PERCENT XE AND 30 PERCENT AR.

----- EXOSAT, TRUMPER -----

#### INVESTIGATION NAME- MEDIUM-ENERGY COSMIC X-RAY PACKAGE

NSSDC ID- EXOSAT -01      INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY

#### PERSONNEL

TL - J. TRUMPER	MPI-EXTRATERR PHYS
TR - H. ZIMMERMAN	MPI-EXTRATERR PHYS
TR - R. STAUBERT	U OF TUBINGEN
TR - K.A. POUNDS	U OF LEICESTER
TR - M. TURNER	U OF LEICESTER

#### BRIEF DESCRIPTION

THE INSTRUMENT CONSISTS OF AN ARRAY OF ARGON-FILLED PROPORTIONAL COUNTERS BACKED UP BY NEON-FILLED COUNTERS WITH AN EFFECTIVE AREA OF 2,000 SQ CM COVERING THE ENERGY RANGE FROM 1.2 TO 50 KEV. THE ARRAY IS DIVIDED INTO FOUR SECTIONS, EACH OF WHICH CAN BE OFFSET FROM THE POINTING DIRECTION TO PROVIDE FOR A VARIABLE FLAT TOP COLLIMATOR RESPONSE. THE COLLIMATORS PROVIDE A FIELD OF VIEW OF 45 ARC MINUTES AND THE DETECTORS HAVE AN ENERGY RESOLUTION OF 20 PERCENT AT 6 KEV FOR ARGON AND AT 22 KEV FOR NEON.

\*\*\*\*\* FIREWHEEL \*\*\*\*\*

SPACECRAFT COMMON NAME- FIREWHEEL  
ALTERNATE NAMES- FEUERRAD

NSSDC ID- FIRE-A

LAUNCH DATE- 05/23/80      WEIGHT- 1080. KG  
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL      ESA

#### PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	INCLINATION- 17. DEG
ORBIT PERIOD- 1118.4 MIN	APPROX IS- 58422. KM ALT
PERIAPSIS- 200. KM ALT	

#### PERSONNEL

PI - B. HAUSLER	MPI-EXTRATERR PHYS
PS - G. HAERENDL	MPI-EXTRATERR PHYS
PS - M. ACUNA	NASA-GSFC

#### BRIEF DESCRIPTION

THIS SPACECRAFT IS DESIGNED TO MAKE BARIUM AND LITHIUM ION RELEASES IN THE NIGHT MAGNETOSPHERE AT 9.5 AND 7 RE, RESPECTIVELY, AND OVER NORTH AND SOUTH AMERICA. THE MAIN SPACECRAFT CARRIES 32 EJECTABLE ION RELEASE CONTAINERS. DIAGNOSTIC MEASUREMENTS WILL BE MADE ON THE MAIN SPACECRAFT AND ON FOUR EJECTABLE SUB-PAYLOADS. THESE SUB-PAYOUTS TOTAL APPROXIMATELY 200 KG. OPTICAL MEASUREMENTS WILL BE MADE FROM THE GROUND AND FROM AIRCRAFT. THE SCIENTIFIC OBJECTIVES ARE: (1) STUDY OF THE PLASMA PROCESSES CONTROLLING THE FORMATION AND DECAY OF A MAGNETIC CAVITY; (2) STUDY OF THE MOMENTUM EXCHANGE WITH THE AMBIENT DILUTE PLASMA AND OF THE LONG-RANGE MAGNETOSPHERIC PERTURBATIONS GENERATED THEREBY; (3) MODIFICATION OF THE INTERACTION OF TRAPPED ENERGETIC PARTICLES WITH SELF-GENERATED WHISTLER MODE AND ION CYCLOTRON WAVES; AND (4) TRACING OF ACCELERATION AND REDISTRIBUTION OF THE INJECTED IONS IN THE INNER MAGNETOSPHERE. THE SPACECRAFT IS BATTERY-POWERED, WITH A LIFETIME OF LESS THAN 48 HOURS.

----- FIREWHEEL, ACUNA -----

#### INVESTIGATION NAME- DC MAGNETOMETER

NSSDC ID- FIRE-A -02      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

#### PERSONNEL

PI - M.H. ACUNA	NASA-GSFC
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#### BRIEF DESCRIPTION

THIS EXPERIMENT IS MOUNTED ON A 2-M BOOM AND PROVIDES THREE-AXIS MAGNETIC FIELD MEASUREMENTS, WITH A RESOLUTION OF 4.4E-3 NT IN THE HIGHEST SENSITIVITY RANGE.

----- FIREWHEEL, FOPPL -----

#### INVESTIGATION NAME- ION RELEASE

NSSDC ID- FIRE-A -01      INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS  
MAGNETOSPHERIC PHYSICS

#### PERSONNEL

PI - H. FOPPL	MPI-EXTRATERR PHYS
OI - A. VALENZUELA	MPI-EXTRATERR PHYS
OI - G. HAERENDL	MPI-EXTRATERR PHYS
OI - E. RIEGER	MPI-EXTRATERR PHYS

#### BRIEF DESCRIPTION

THIS EXPERIMENT IS DESIGNED TO RELEASE BARIUM AND LITHIUM ION CLOUDS. THE BARIUM RELEASED IS FROM A TOTAL OF EIGHT CONTAINERS, EACH FILLED WITH 20 KG OF BARIUM-COPPER OXIDE MIXTURE. THE LITHIUM IS RELEASED FROM FOUR CONTAINERS, EACH WITH 10 KG OF LITHIUM-COPPER OXIDE MIXTURE. THE BARIUM AND LITHIUM RELEASES INJECT A TOTAL OF APPROXIMATELY 1.0E26 IONS INTO THE MAGNETOSPHERE.

\*\*\*\*\* FIREWHEEL HAUSLER\*\*\*\*\*

INVESTIGATION NAME- AC MAGNETOMETER

NSSDC ID- FIRE-A-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - D. HAUSLER

MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

THIS EXPERIMENT (A ONE-AXIS SEARCH COIL) MEASURES MAGNETIC FIELD FLUCTUATIONS IN THE RANGE FROM APPROXIMATELY 10 Hz TO 6 kHz. THE SENSITIVITY OF THE COIL IS APPROXIMATELY 7 MICROVOLTS/NT Hz.

\*\*\*\*\* FIREWHEEL MCENTIRE\*\*\*\*\*

INVESTIGATION NAME- ION COMPOSITION TELESCOPE

NSSDC ID- FIRE-A-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE PLASMAS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.W. MCENTIRE  
OI - S.M. KRIMIGIS

APPLIED PHYSICS LAB  
APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS INSTRUMENT (ICT) LOOKS RADIALLY OUTWARD FROM THE FIREWHEEL MAIN BUS AND COMBINES MEASUREMENT OF ION TIME-OF-FLIGHT AND TOTAL ENERGY TO PROVIDE GOOD ELEMENTAL RESOLUTION FOR ENERGETIC MAGNETOSPHERIC NUCLEI OVER THE ENERGY RANGE 25 TO 500 KEV/NUCLEON, WITH A GEOMETRY FACTOR OF 6.03 SO CM SR. THE TELESCOPE CONSISTS OF A THIN FOIL FRONT ELEMENT, A 10 CM TIME-OF-FLIGHT PATH, AND A SOLID STATE DETECTOR REAR ELEMENT, WITH TIMING SIGNALS DERIVED FROM SECONDARY ELECTRONS. EVENTS ARE RECORDED IN 8 SPECIES/ENERGY RATE CHANNELS, EACH SECTORED BY 36°, AND HIGH-PRIORITY EVENTS ARE PULSE HEIGHT ANALYZED.

\*\*\*\*\* FIREWHEEL SUB-SAT 1\*\*\*\*\*

SPACECRAFT COMMON NAME- FIREWHEEL SUB-SAT 1  
ALTERNATE NAMES- MPE SUB-PAYOUT

NSSDC ID- FIRE-E

LAUNCH DATE- 05/23/80  
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
LAUNCH VEHICLE- ARIANE

WEIGHT- 49. KG

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL

ESA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC

ORBIT PERIOD- 1118.4 MIN

PERIAPSIS- 200. KM

INCLINATION- 17. DEG

APOAPSIS- 58422. KM ALT

PERSONNEL

PI - G. PASCHMANN  
PS - G. PASCHMANN

MPI-EXTRATERR PHYS  
MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

THIS SUB-PAYOUT IS EJECTED FROM FIRE-A, AND CARRIES DIAGNOSTIC INSTRUMENTS FOR OBSERVATION OF THE ION RELEASES IN THE NIGHT MAGNETOSPHERE. TELEMETRY IS 4096 BPS AT 136.26 MHZ. THE SPACECRAFT IS BATTERY-OPERATED, WITH A LIFETIME OF LESS THAN 48 HOURS. AN ANTENNA WITH APPROXIMATELY 42 M TIP-TO-TIP WILL BE DEPLOYED.

\*\*\*\*\* FIREWHEEL SUB-SAT 1, ACUNA\*\*\*\*\*

INVESTIGATION NAME- DC MAGNETOMETER

NSSDC ID- FIRE-E-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - M.H. ACUNA

NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTS OF A 3-AXIS FLUXGATE MAGNETOMETER WITH A RANGE OF -256 TO +256 NT.

\*\*\*\*\* FIREWHEEL SUB-SAT 1, GURNETT\*\*\*\*\*

INVESTIGATION NAME- PLASMA WAVE

NSSDC ID- FIRE-E-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A. GURNETT  
OI - R.R. ANDERSON  
OI - M.C. KELLEY  
OI - P.M. KINTNER  
OI - R. BOSWELL  
OI - D. HAUSLER

U OF IOWA  
U OF IOWA  
CORNELL U  
CORNELL U  
ESA-ESTEC  
MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

DESCRIPTION OF THE EXPERIMENT HAS NOT BEEN RECEIVED.

\*\*\*\*\* FIREWHEEL SUB-SAT 1, PASCHMANN\*\*\*\*\*

INVESTIGATION NAME- LOW-ENERGY ELECTRON AND ION DETECTOR

NSSDC ID- FIRE-E-02

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - G. PASCHMANN  
OI - S.J. BARE

MPI-EXTRATERR PHYS  
LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

DESCRIPTION OF THE EXPERIMENT HAS NOT BEEN RECEIVED.

\*\*\*\*\* FIREWHEEL SUB-SAT 1, SPENNER\*\*\*\*\*

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- FIRE-E-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - K. SPENNER  
OI - W. OTT

INST FUR PHYS WELTRAUM  
INST FUR PHYS WELTRAUM

BRIEF DESCRIPTION

DESCRIPTION OF THE EXPERIMENT HAS NOT BEEN RECEIVED.

\*\*\*\*\* FIREWHEEL SUB-SAT 2\*\*\*\*\*

SPACECRAFT COMMON NAME- FIREWHEEL SUB-SAT 2

ALTERNATE NAMES- SRC SUB-PAYOUT

NSSDC ID- FIRE-B

LAUNCH DATE- 05/23/80  
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
LAUNCH VEHICLE- ARIANE

WEIGHT- 48. KG

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL

ESA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC

ORBIT PERIOD- 1118.4 MIN

PERIAPSIS- 200. KM

INCLINATION- 17. DEG

APOAPSIS- 58422. KM ALT

PERSONNEL

PI - R.W. MASON  
PS - D.A. BRYANT

APPLETON LAB  
APPLETON LAB

BRIEF DESCRIPTION

THIS SUB-PAYOUT IS EJECTED FROM FIRE-A, AND CARRIES DIAGNOSTIC INSTRUMENTS FOR OBSERVATION OF THE ION RELEASES IN THE NIGHT MAGNETOSPHERE. TELEMETRY IS 6.4 Kbps AT 2206.5 MHZ. THE SPACECRAFT IS BATTERY-OPERATED, WITH A LIFETIME OF LESS THAN 48 HOURS.

\*\*\*\*\* FIREWHEEL SUB-SAT 2, ACUNA\*\*\*\*\*

INVESTIGATION NAME- DC MAGNETOMETER

NSSDC ID- FIRE-B-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

ORIGINAL PAGE IS  
OF POOR QUALITY

**PERSONNEL**

PI - R.H. ACUNA

NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTS OF A 3-AXIS FLUFGATE MAGNETOMETER WITH A RANGE OF -256 TO +256 NT, WITH A SAMPLING RATE OF 25 MEASUREMENTS PER SECOND FOR EACH AXIS.

----- FIREWHEEL SUB-SAT 2: BRYANT-----

**INVESTIGATION NAME-** ENERGETIC PARTICLE

NSSDC ID- FIRE-B-02

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - D.A. BRYANT  
OI - R.S. HALL

APPLETON LAB  
APPLETON LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES OBITAL ELECTROSTATIC ANALYZERS WITH CHANNEL ELECTRON MULTIPLIER DETECTORS. THERE ARE 4 POSITIVE ION ANALYZERS, VIEWING AT 0, 45, 90, AND 180 DEG WITH RESPECT TO THE SPIN AXIS. THERE ARE 3 ELECTRON ANALYZERS, VIEWING AT 45, 90, AND 180 DEG WITH RESPECT TO THE SPIN AXIS. THE ENERGY RANGE FOR BOTH ELECTRONS AND IONS IS 0.0 TO 20 KEV, WITH 128 LEVELS, SCANNED IN 8 S AND 10 S PERIODS. THE SAMPLING RATES ARE 25 AND 50 PER S.

----- FIREWHEEL SUB-SAT 2: JOHNSTONE-----

**INVESTIGATION NAME-** SUPRATHERMAL ELECTRONS

NSSDC ID- FIRE-B-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - A.D. JOHNSTONE

HULLARD SPACE SCI LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES MERISPERICAL ELECTROSTATIC ANALYZERS AND CHANNEL ELECTRON MULTIPLIERS. THERE ARE 3 POSITIVE ION ANALYZERS, VIEWING AT 10, 90, AND 170 DEG WITH RESPECT TO THE SPIN AXIS. THERE IS A SINGLE ELECTRON ANALYZER VIEWING AT 90 DEG TO THE SPIN AXIS. THE ENERGY RANGE FOR BOTH ELECTRONS AND IONS IS 5 TO 500 EV, WITH 50 LEVELS, SCANNED IN 0.9 S.

----- FIREWHEEL SUB-SAT 2: WRENN-----

**INVESTIGATION NAME-** LANGMUIR PROBE

NSSDC ID- FIRE-B-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - G.L. WRENN

U COLLEGE LONDON

**BRIEF DESCRIPTION**

THIS INVESTIGATION IS DESIGNED TO DETERMINE THE NUMBER DENSITY AND TEMPERATURE OF THE THERMAL PLASMA. SAMPLING RATE IS 25 PER SECOND.

\*\*\*\*\* FIREWHEEL SUB-SAT 3 \*\*\*\*\*

**SPACECRAFT COMMON NAME-** FIREWHEEL SUB-SAT 3  
**ALTERNATE NAMES-** UCD SUB-PAYOUT

NSSDC ID- FIRE-C

LAUNCH DATE- 05/23/80  
LAUNCH SITE- KOUROU (CENTRE SF GUYANAIS), FRANCE  
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL  
ESA

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1130.6 MIN  
PERIAPSIS- 200. KM ALT

WEIGHT- 50. KG  
INCLINATION- 1. DEG  
APOAPSIS- 58422. KM ALT

FAILED AT LAUNCH

**PERSONNEL**

PI - H. HEETBERGS  
OI - P.S. POZER

U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS SUB-PAYLOAD IS EJECTED FROM FIRE-A, AND CARRIES DIAGNOSTIC INSTRUMENTS FOR OBSERVATION OF THE ION RELEASES IN THE NIGHT MAGNETOSPHERE. TELEMETRY IS 8192 BPS AT 2203.0 MHZ. THE SPACECRAFT IS BATTERY-OPERATED, WITH A LIFETIME OF LESS THAN 60 HOURS. WIRE ROOMS WITH APPROXIMATELY 90 M TIP-TO-TIP WILL BE DEPLOYED.

----- FIREWHEEL SUB-SAT 3: ACUNA-----

**INVESTIGATION NAME-** DC/AC MAGNETOMETER

NSSDC ID- FIRE-C-01

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - R.H. ACUNA  
OI - R.B. TORBERT

NASA-GSFC  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTS OF A 3-AXIS FLUFGATE MAGNETOMETER WITH A RANGE OF -256 TO +256 NT. A FAST WAVEFORM DIGITIZING CHANNEL IS USED TO OBTAIN HIGH TIME RESOLUTION (256 Hz) SNAPSHOTS OF MAGNETIC FIELD DATA.

----- FIREWHEEL SUB-SAT 3: BUSH-----

**INVESTIGATION NAME-** ENERGETIC ION MASS SPECTROMETER

NSSDC ID- FIRE-C-02

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - R. BUSH  
OI - C.W. CARLSON

U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT CAN IDENTIFY IONS UP THROUGH BARIUM, WITH ENERGIES LESS THAN 3 KEV.

----- FIREWHEEL SUB-SAT 3: CARLSON-----

**INVESTIGATION NAME-** LOW-ENERGY ELECTRON DETECTOR

NSSDC ID- FIRE-C-03

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - C.W. CARLSON

U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS A RETARDING POTENTIAL ANALYZER, WITH AN ENERGY RANGE OF 0-500 EV.

----- FIREWHEEL SUB-SAT 3: CARLSON-----

**INVESTIGATION NAME-** ELECTRON DENSITY MEASUREMENT

NSSDC ID- FIRE-C-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - C.W. CARLSON  
OI - E. CATTEL

U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT UTILIZES A LANGMUIR PROBE AND MEASURES THE DENSITY AND THE LOW FREQUENCY FLUCTUATIONS IN THE DENSITY OF LOW ENERGY ELECTRONS, IN THE RANGE APPROXIMATELY 0-50 EV. DENSITY FLUCTUATIONS UP TO APPROXIMATELY 10 Hz CAN BE OBSERVED.

----- FIREWHEEL SUB-SAT 3: CATTEL-----

**INVESTIGATION NAME-** PROTON/ELECTRON ELECTROSTATIC ANALYZER

NSSDC ID- FIRE-C-05

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**  
PI - J. HALLINGERDOTT  
SI - R. BUSH

U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT MEASURES IONS AND ELECTRONS WITHIN THE ENERGY RANGE 0-20 KEV.

----- FIREWHEEL SUB-SAT 3, MOZER-----

**INVESTIGATION NAME-** DC/VAC ELECTRIC FIELD

**NSSDC ID-** FIRE-C-02      **INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**  
PI - F.D. MOZER  
SI - R.P. TORDERT  
SI - C. CATTEL

U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY  
U OF CALIF, BERKELEY

**BRIEF DESCRIPTION**

THIS EXPERIMENT EMPLOYS A DOUBLE PROBE ELECTRIC FIELD SENSOR. DC FIELDS FROM 0.1 TO 100 MV/M ARE MEASURED. THE AC FIELD MEASUREMENT HAS A THRESHOLD OF APPROXIMATELY 1 MICROVOLT/M (SQUARE ROOT Hz) A DYNAMIC RANGE OF APPROXIMATELY 1.6x, AND A FREQUENCY RESPONSE TO 9 MHZ.

\*\*\*\*\* FIREWHEEL SUB-SAT 4, WHALEN\*\*\*\*\*

**SPACECRAFT COMMON NAME-** FIREWHEEL SUB-SAT 4  
**ALTERNATE NAMES-** NRC SUB-PAYOUT

**NSSDC ID-** FIRE-D

**LAUNCH DATE-** 05/23/80      **WEIGHT-** 52.6 KG  
**LAUNCH SITE-** KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
**LAUNCH VEHICLE-** ARIANE

**SPONSORING COUNTRY/AGENCY**  
INTERNATIONAL      **ESA**

**PLANNED ORBIT PARAMETERS**  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 11138.0

INCLINATION- 17.0 DEG  
PERIAPSIS- 58422. KM ALT

**PERSONNEL**  
PH - R.B. BRAUN  
PS - R.A. WHALEN

SED SYSTEMS, LTD  
NATL RES COUNC OF CAN

**BRIEF DESCRIPTION**

THIS SUB-PAYLOAD IS EJECTED FROM FIRE-A, AND CARRIES DIAGNOSTIC INSTRUMENTS FOR OBSERVATION OF THE ION RELEASES IN THE NIGHT MAGNETOSPHERE. TELEMETRY IS 6000 BPS AT 2207.0 MHZ. THE SPACECRAFT IS BATTERY-OPERATED, WITH A LIFETIME OF LESS THAN 48 HOURS. THE INSTRUMENTS WILL MEASURE THE CHARGED PARTICLE DISTRIBUTIONS AND THE LOCAL VECTOR MAGNETIC FIELD.

\*\*\*\*\* FIREWHEEL SUB-SAT 4, ACUNA\*\*\*\*\*

**INVESTIGATION NAME-** DC MAGNETOMETER

**NSSDC ID-** FIRE-D-01      **INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**  
PI - R.H. ACUNA

NASA-GSFC

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTS OF A 3-AXIS FLUXGATE MAGNETOMETER WITH A RANGE OF -512 TO +512 NT. IT WILL MONITOR THE AMBIENT MAGNETIC FIELD AS WELL AS THE MAGNETIC PERTURBATIONS INDUCED BY THE CHEMICAL RELEASES.

\*\*\*\*\* FIREWHEEL SUB-SAT 4, MCNAMARA\*\*\*\*\*

**INVESTIGATION NAME-** LANGMUIR PROBE

**NSSDC ID-** FIRE-D-02      **INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**  
PI - A.G. MCNAMARA

NATL RES COUNC OF CAN

**BRIEF DESCRIPTION**

THIS EXPERIMENT, WHICH MEASURES THE LOCAL ELECTRON DENSITY AND TEMPERATURES, WILL GIVE HIGH TEMPORAL RESOLUTION MEASUREMENTS ON THE PASSAGE OF THE SHOCK FRONT ASSOCIATED WITH THE BARIUM RELEASE. IT WILL ALSO PROVIDE MEASUREMENTS ON THE AMBIENT CONDITIONS WHERE POSSIBLE. ENERGY RANGES MEASURED ARE 0-5 EV FOR ELECTRONS AND 0-3 EV FOR POSITIVE IONS.

\*\*\*\*\* FIREWHEEL SUB-SAT 4, WHALEN\*\*\*\*\*

**INVESTIGATION NAME-** ENERGETIC CHARGED PARTICLE DETECTORS

**NSSDC ID-** FIRE-D-03      **INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - R.A. WHALEN

NATL RES COUNC OF CAN

**BRIEF DESCRIPTION**

THIS EXPERIMENT CONSISTS OF ARRAYS OF SOLID STATE DETECTORS, SPHERICAL AND CYLINDRICAL PLATE ELECTROSTATIC ANALYZERS, AND AN R.F. TYPE ENERGETIC ION MASS SPECTROMETER. TWO SOLID STATE PARTICLE DETECTORS WITH DEPLETION DEPTHS OF 700 MICROMETERS AND 10 MICROMETERS WILL BE USED, IN CONJUNCTION WITH ALUMINUM ABSORBERS, TO MEASURE THE ELECTRON FLUX IN THE 20 TO 500 KEV RANGE AND IONS FROM 100 TO 500 KEV. BOTH SENSORS WILL LOOK AT 90 DEG TO THE SUBSATELLITE SPIN AXIS. PITCH ANGLE DISTRIBUTIONS, WHICH WILL BE DERIVED FROM THE SPINNING MOTION OF THE SUBSATELLITE, WILL BE PARTICULARLY RELEVANT TO THE COLD PLASMA ( $L+$ ) SEEDING EXPERIMENT. THE ANGULAR RESOLUTION WILL BE 8 DEGREES FOR THE ELECTRONS AND 10 DEGREES FOR THE ION MEASUREMENTS. AN ARRAY OF THREE SPHERICAL PLATE ELECTROSTATIC ANALYZERS WILL SAMPLE THE 3 DIMENSIONAL POSITIVE ION DISTRIBUTION FUNCTION IN THE ENERGY/CHARGE RANGE 2 EV/0 TO 20 KEV/0. THESE ANALYZERS, MOUNTED TO LOOK AT 45, 70, AND 135 DEG TO THE SPIN AXIS, WILL SUPPLY INFORMATION ON THE VECTOR ION DRIFT VELOCITY EVERY SUBSATELLITE ROTATION (APPROXIMATELY 10 SECONDS). A CYLINDRICAL PLATE ELECTROSTATIC ANALYZER MOUNTED AT 90 DEG TO THE SPIN AXIS WILL MONITOR THE ELECTRON SPECTRUM AND PITCH ANGLE DISTRIBUTIONS IN THE 210 EV/0 TO 25 KEV/0 RANGE. THE R.F. TYPE ION MASS SPECTROMETER WILL MEASURE THE ION MASS COMPOSITION IN THE ENERGY PER UNIT CHARGE RANGE FROM 3 EV/0 TO 5 KEV/0 AND A MASS/UNIT CHARGE RANGE FROM 1 ( $H+$ ) UP TO 137 ( $BA^+$ ) WITH A MASS RESOLUTION DELTA M/M = 0.25. THE DESIGN OF THE ANALYZER IS SIMILAR IN PRINCIPLE TO THE BENNETT MASS SPECTROMETER BUT HAS BEEN MODIFIED TO OPERATE UP TO 5 KEV/0. DIFFERENTIAL ENERGY ANALYSIS IS PERFORMED BY A SERIES OF PLANAR GRIDS AND MASS ANALYSIS BY AN R.F. SECTION WHICH REQUIRES A LARGE AMPLITUDE R.F. SIGNAL (300 kHz TO 4 MHz). THE DEVICE WILL LOOK AT 90 DEG TO THE SPIN AXIS. THE MAJOR OBJECTIVE FOR THIS DEVICE WILL BE TO STUDY THE TRANSPORT AND ENERGIZATION OF  $L+$  AND  $BA^+$  IONS.

\*\*\*\*\* GALILEO ORBITER\*\*\*\*\*

**SPACECRAFT COMMON NAME-** GALILEO ORBITER  
**ALTERNATE NAMES-** JUPITER ORBITER PROBE; JOP  
GALILEO

**NSSDC ID-** JOPO

**LAUNCH DATE-** 02/20/84      **WEIGHT-** 600. KG  
**LAUNCH SITE-** CAPE CANAVERAL, UNITED STATES  
**LAUNCH VEHICLE-** SHUTTLE

**SPONSORING COUNTRY/AGENCY**  
UNITED STATES      **NASA-OSB**

**PLANNED ORBIT PARAMETERS**  
ORBIT TYPE- JUPITER ORBITER  
ORBIT PERIOD- 66000. MIN  
PERIAPSIS- 425000. KM ALT      **INCLINATION-** 0.0 DEG  
APOAPSIS- 986000. KM ALT

**PERSONNEL**  
MG - D.B. McCULLAR  
SC - R.E. MURPHY  
PH - J. CASANI  
PH - W.S. SHIPLEY  
PS - T.V. JOHNSON

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-JPL  
NASA-JPL  
NASA-JPL

**BRIEF DESCRIPTION**

THE GALILEO MISSION CONSISTS OF A JUPITER ORBITER AND A SEPARATE JUPITER ATMOSPHERIC ENTRY PROBE. THE ORBITER WILL BE LAUNCHED FROM THE SHUTTLE WITH THE IUS AND WILL USE A MARS POWERED FLYBY. THE ORBITER SERVES AS A RELAY LINE TO EARTH FROM THE PROBE. THE ORBITER POWER SOURCE IS A MODULAR 500-W SELENIUM ISOTOPIC GENERATOR (SIG) THAT PROVIDES 28 V OF DC CURRENT TO ALL SUBSYSTEMS. THE TWO SIG'S ARE RATED AT 250 W EACH. TEMPERATURE IS CONTROLLED BY RADIOISOTOPE HEATER UNITS (RHUS'). TELEMETRY IS BY A TWO-CHANNEL DOWNLINK, ONE FOR CONTINUOUS TRANSMISSION OF FIXED FORMAT (6.25 BPS) ON THE S-BAND, AND THE OTHER FOR REAL-TIME PLAYBACK DATA AT RATES BETWEEN 2 AND 128 KPS ON THE X-BAND.

----- GALILEO ORBITER, ANDERSON -----

INVESTIGATION NAME - RADIO SCIENCE

NSSDC ID - J090 - 01 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP  
  
INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
RADIO PHYSICS  
PLANETARY ATMOSPHERES  
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - J.D. ANDERSON  
TM - V.R. ESHLEMAN  
TM - F.B. ESTABROOK  
TM - G. FJELDGA  
TM - E. GERARD  
TM - S. GULRIS  
TM - A.J. KLIJORE  
TM - R. MOO  
TM - G.F. LINCOLN  
  
NASA-JPL  
STANFORD U  
NASA-JPL  
NASA-JPL  
PARIS OBSERVATORY  
NASA-JPL  
NASA-JPL  
NASA-JPL  
NASA-JPL

BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO: (1) INVESTIGATE THE HIGH-ALTITUDE NEUTRAL ATMOSPHERE OF JUPITER, USING OCCULTATION TECHNIQUES TO MEASURE PRESSURE, TEMPERATURE, MOLECULAR WEIGHT, AND TURBULENCE; (2) INVESTIGATE THE IONOSPHERE OF JUPITER AND ITS INTERACTION WITH THE MAGNETOSPHERE, USING OCCULTATION TECHNIQUES TO DETERMINE ELECTRON NUMBER DENSITY AND PLASMA SCALE HEIGHTS; (3) DETERMINE THE SIZES AND SHAPES OF THE GALILEAN SATELLITES; (4) SEARCH FOR AND CHARACTERIZE ATMOSPHERES AND IONOSPHERES OF THE GALILEAN SATELLITES; AND STUDY THEIR INTERACTIONS WITH THE JOVIAN MAGNETOSPHERE; (5) DETERMINE THE STRUCTURE OF THE GRAVITATIONAL FIELD OF JUPITER FROM DOPPLER TRACKINGS; (6) DETERMINE THE MASSES AND GRAVITATIONAL MOMENTS OF THE GALILEAN SATELLITES AND IMPROVE KNOWLEDGE OF THEIR ORBITS; (7) STUDY TURBULENCE, ELECTRON DENSITY FLUCTUATIONS, AND WINDS IN THE JOVIAN IONOSPHERE; (8) INVESTIGATE MICROWAVE EMISSION FROM THE ATMOSPHERE AND TRAPPED RADIATION BELTS OF JUPITER; AND (9) SEARCH FOR VLF GRAVITATIONAL WAVES INCIDENT ON THE SOLAR SYSTEM TO A LEVEL OF STRAIN AMPLITUDE APPROXIMATELY 1.8E-19. INVESTIGATORS USE THE SIGNALS TRANSMITTED BETWEEN THE EARTH AND THE ORBITER AND BETWEEN THE PROBE AND THE ORBITER TO CARRY OUT THEIR INVESTIGATIONS. THE EARTH-ORBITER COMMUNICATIONS USE AN S-BAND (2115 MHZ) UPLINK AND TRANSPONDER TO GENERATE A COHERENT S-X BAND DOWNLINK (2297 MHZ AND 8422 MHZ), USING AN EARTH-ORIENTED 8-M DISH ANTENNA. THE FREQUENCY STABILITY IS APPROXIMATELY 1 PART IN 1.E+13. THE PROBE-TO-ORBITER TRANSMISSION IS AT A FREQUENCY BETWEEN 3 AND 2 GHZ, USING A WIDE-BAND RECEIVER AND BODY-FIRED 1-M DISH ANTENNA. FOLLOWING THE PROBE MISSION THIS RECEIVER AND ANTENNA ARE AVAILABLE TO CARRY OUT ADDITIONAL INVESTIGATIONS. INDIVIDUAL INVESTIGATORS AND THEIR INVESTIGATIONS ARE LISTED IN APPENDIX B.

----- GALILEO ORBITER, BELTON -----

INVESTIGATION NAME - ORBITER IMAGING

NSSDC ID - J090 - 02 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP  
  
INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.J.E. BELTON  
TM - L.B. ANGER  
TM - C.B. CHAPMAN  
TM - M.E. DAIVES  
TM - R. GREENLEY  
TM - R. GREENBERG  
TM - J.M. HEAD, SRD  
TM - G. NEUKUM  
TM - G. SCHUBERT  
TM - C.B. PILCHER  
TM - J. VEVERKA  
TM - M.N. CARR  
TM - J.D. WELLMAN  
  
KITT PEAK NATL OBS  
U OF CALGARY  
PLANETARY SCIENCE INST  
BAND CORP  
ARIZONA STATE U  
PLANETARY SCIENCE INST  
BROWN U  
MPI-NUCLEAR PHYS  
U OF CALIF., LA  
U OF ARKANS  
CORNELL U  
US GEOLOGICAL SURVEY  
NASA-JPL

BRIEF DESCRIPTION

THE PURPOSE OF THIS INVESTIGATION IS TO STUDY JUPITER AND ITS SATELLITES THROUGH MULTI-SPECTRAL, HIGH-RESOLUTION IMAGING WITH A CCD CAMERA. SPECIFIC SCIENCE OBJECTIVES ARE TO: (1) INVESTIGATE THE STRUCTURE OF THE JOVIAN ATMOSPHERE AND CLOUDS THROUGH MULTI-SPECTRAL PHOTOPOTRY AND POLARIMETRY; (2) INVESTIGATE THE DYNAMICS OF THE JOVIAN ATMOSPHERE THROUGH SYNOPTIC IMAGING OF CLOUD STRUCTURES; (3) MEASURE THE SIZES AND SHAPES OF THE GALILEAN SATELLITES AND DETERMINE THEIR LIBRATIONS; (4) MAP THE SURFACE MORPHOLOGY OF THE GALILEAN SATELLITES AT SPATIAL RESOLUTION BETTER THAN 1 KM AND OVER A RANGE OF VIEWING AND LIGHTING ANGLES IN ORDER TO INVESTIGATE THE GEOLOGICAL PROCESSES THAT HAVE ACTED ON THEIR SURFACES; (5) USE MULTISPECTRAL IMAGING TO IDENTIFY AND MAP THE DISTRIBUTION OF ICES AND MINERALS ON THE SURFACES OF THE SATELLITES; (6) SEARCH FOR AURORAL OR OTHER ATMOSPHERIC EMISSION ON THE NIGHT SIDE OF JUPITER, ON THE SATELLITES, AND IN CIRCUM-JOVIAN SPACES; AND (7) SEEK TARGETS OF OPPORTUNITY FOR IMAGING THE IRREGULAR SATELLITES OF JUPITER. THE IMAGING INVESTIGATION USES A SINGLE CAMERA CONSISTING OF A 1500-NANOPETTER FOCAL LENGTH CATADROPTIC TELESCOPE IMAGING ONTO AN 800 X 800 ELEMENT CHARGE-COUPLED

DEVICE (CCD). OPTICS ARE FUSED SILICON. AN EIGHT-POSITION FILTER WHEEL (FILTERS NOT SPECIFIED) IS USED. THE SPECTRAL RESPONSE IS 350 TO 1100 NANOMETERS. RESOLUTION IS 20 MICRORAD PER LINE PAIR; THE FIELD OF VIEW IS 0.008 RAD (10.46 DEG); THE MINIMUM EXPOSURE IS 9 MILLISECONDS, AND THE MAXIMUM FRAME RATE IS ABOUT 1/MIN. THE LINEAR DYNAMIC RANGE EXCEEDS 1000, WITH 8 BIT/Pixel ENCODING. THE INSTRUMENT IS MOUNTED ON THE SCAN PLATFORM OF THE ORBITER. THE TOTAL MASS IS 23 KG AND THE TOTAL CONTINUOUS POWER IS 23 W. INDIVIDUAL INVESTIGATORS AND THEIR INVESTIGATIONS ARE LISTED IN APPENDIX B.

----- GALILEO ORBITER, CARLSON -----

INVESTIGATION NAME - NEAR INFRARED MAPPING SPECTROMETER (NIMS) INVESTIGATION AND MAPPER

NSSDC ID - J090 - 03 INVESTIGATIVE PROGRAM  
CODE SL  
  
INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
GEODESY AND CARTOGRAPHY

PERSONNEL

PI - R.W. CARLSON  
OI - T.V. JOHNSON  
OI - G.E. DANIELSON  
OI - F.P. FANALE  
OI - H.M. KIEFFER  
OI - J.S. LEWIS  
OI - M. MASURSKY  
OI - D.L. MATSON  
OI - T.D. REED  
OI - L.A. SODERBLOM  
OI - F. TAYLOR  
  
NASA-JPL  
NASA-JPL  
CALIF INST OF TECH  
NASA-JPL  
US GEOLOGICAL SURVEY  
MASS INST OF TECH  
US GEOLOGICAL SURVEY  
NASA-JPL  
U OF HAWAII  
US GEOLOGICAL SURVEY  
NASA-JPL

BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO: (1) MAP THE MINERAL DISTRIBUTION ON THE SURFACES OF THE SATELLITES OF JUPITER AT A SPATIAL RESOLUTION OF 5 TO 35 KM; (2) IDENTIFY THE INDIVIDUAL PHASES AND MIXTURES PRESENT; (3) RELATE THE MINERALOGICAL PROVINCES TO GEOLOGICAL PROVINCES OBSERVED WITH THE IMAGING SYSTEM; AND (4) MAP REGIONS OF THE JOVIAN ATMOSPHERE OVER A WIDE RANGE OF PHASE ANGLES TO DETERMINE CLOUD MORPHOLOGY AND VERTICAL STRUCTURE. THE INSTRUMENT IS A HIGH-SPEED SCANNING REFLECTION GRATING SPECTROMETER MOUNTED ON THE SCAN PLATFORM OF THE ORBITER. IMAGING IS DONE BY A 20-CM APERTURE TELESCOPE ONTO AN INSD DETECTOR ARRAY IN ORDER TO PRODUCE MULTI-SPECTRAL LINE IMAGES OF SOURCES WITHOUT EXTERNAL SCANNING. ANGULAR RESOLUTION IS 0.9 MILLIRAD AND THE SPECTRAL RANGE IS 0.9 TO 2.0 MICRORAMETERS IN 344 CHANNELS AT A SPECTRAL RESOLUTION OF 0.03 MICRORAMETERS. THE TOTAL MASS OF THE SPECTROMETER IS 11 KG AND THE TOTAL POWER IS 8 W.

----- GALILEO ORBITER, FANALE -----

INVESTIGATION NAME - FORMATION AND EVOLUTION OF THE GALILEAN SATELLITES

NSSDC ID - J090 - 02 INVESTIGATIVE PROGRAM  
CODE SL  
  
INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY

PERSONNEL

PI - F.P. FANALE  
NASA-JPL

BRIEF DESCRIPTION

THIS INVESTIGATION UTILIZES GALILEO ORBITER REMOTE SENSING DATA, PRIMARILY FROM THE IMAGING, NIMS, AND UVIS INVESTIGATIONS, TO STUDY THE FORMATIONAL CONDITIONS AND SUBSEQUENT GEOLOGICAL EVOLUTION OF THE GALILEAN SATELLITES, INCLUDING THE INTERACTION OF THESE BODIES WITH THEIR SPACE ENVIRONMENTS.

----- GALILEO ORBITER, FRANK -----

INVESTIGATION NAME - PLASMA

NSSDC ID - J090 - 04 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP  
  
INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.A. FRANK  
OI - F.W. CORONITI  
OI - V.R. VASYLJUNAS  
  
U OF IOWA  
U OF CALIF., LA  
MPS-AERONOMY

BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO: ESTABLISH THE SOURCES OF JOVIAN PLASMAS; INVESTIGATE PLASMA INTERACTIONS WITH THE JOVIAN SATELLITES; INVESTIGATE THE ROLE OF PLASMA AS A SOURCE FOR ENERGETIC CHARGED PARTICLES IN THE RADIATION ZONES; DETERMINE THE NATURE OF THE EQUATORIAL CURRENT SHEETS; AND EVALUATE THE ROLES OF MAGNETIC MERGING, CO-ROTATIONAL FORCES AND FIELD-ALIGNED CURRENTS IN THE DYNAMICS OF THE JOVIAN MAGNETOSPHERE. THE INVESTIGATION USES AN ELECTROSTATIC

ANALYZER (QUADRISpherical LEPDSEA) IN DETERMINING DIFFERENTIAL ENERGY SPECTRA OF BOTH POSITIVE IONS AND ELECTRONS WITH ESSENTIALLY COMPLETE ANGULAR COVERAGE IN 63 CONTIGUOUS PASSBANDS. THE FRACTIONAL ENERGY RESOLUTION IS 0.17 AND THE RANGE IS 1 EV TO 50 KEV. THREE MINIATURE MASS SPECTROMETERS AT THE ANALYZER EXIT APERTURE ARE USED FOR MASS ANALYSIS, WITH A FRACTIONAL MASS RESOLUTION OF 0.10, SUFFICIENT TO IDENTIFY H<sup>+</sup>, HE<sup>+</sup>, NE<sup>+</sup>, NA<sup>+</sup>, K<sup>+</sup>, AND S<sup>+</sup>. THE ANALYZER IS MOUNTED ON A SHORT DOOR ON THE SPINNING SECTION OF THE ORBITER. THE TOTAL MASS (EXCLUDING THE DOOR) IS 6.9 KG, AND THE TOTAL POWER IS 7.2 W.

----- GALILEO ORBITER, GIERASCH -----

INVESTIGATION NAME- JOVIAN ATMOSPHERIC DYNAMICS

NSBDC ID- J0P0 -03 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - P.J. GIERASCH CORNELL U

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO UTILIZE DATA FROM THE IMAGING AND NIMS INVESTIGATIONS ON THE ORBITER, TOGETHER WITH IN SITU ATMOSPHERE DATA FROM THE PROBE, TO STUDY DYNAMICS OF THE ATMOSPHERE WITH PARTICULAR EMPHASIS ON THE NATURE AND CAUSE OF THE HORIZONTAL TEMPERATURE GRADIENTS BEHIND THE CLOUDS.

----- GALILEO ORBITER, GRARD -----

INVESTIGATION NAME- ELECTRON Emitter

NSBDC ID- J0P0 -05 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
SPACE PLASMAS

PERSONNEL

PI - R.J.L. GRARD	ESA-ESTEC
OI - S.E. DEFORDST	U OF CALIF., SAN DIEGO
OI - R.M. GOLDSTEIN	NASA-JPL
OI - A. GONFALONE	ESA-ESTEC
OI - D. JONES	ESA-ESTEC
OI - K. KNOTT	ESA-ESTEC
OI - A. PEDERSEN	ESA-ESTEC

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO CLAMP THE POTENTIAL OF THE SPACECRAFT TO THAT OF THE SURROUNDING PLASMA AND MEASURE ELECTRON SATURATION CURRENT COLLECTED BY THE SPACECRAFT, AND TO INVESTIGATE THE LOW ENERGY ELECTRON DENSITY AND TEMPERATURE, THE FLOATING POTENTIAL OF THE SPACECRAFT, AND THE CONDUCTION CURRENT OF ELECTROMAGNETIC AND ELECTROSTATIC WAVES UP TO THE LOCAL PLASMA FREQUENCY. THREE INDIRECTLY HEATED CATHODES WITH APPROPRIATE ELECTRONICS ARE MOUNTED ON THE DESPIN SECTION OF THE ORBITER, WITH CATHODES ON A SHORT (90-CM) DOOR. THE TOTAL MASS (EXCLUDING THE DOOR) IS 3.0 KG AND THE TOTAL POWER IS 2.9 W.

----- GALILEO ORBITER, GRUN -----

INVESTIGATION NAME- DUST

NSBDC ID- J0P0 -07 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST  
PARTICLES AND FIELDS

PERSONNEL

PI - E. GRUN	MPI-NUCLEAR PHYS
OI - H. FECHTIG	MPI-NUCLEAR PHYS
OI - J. KISSEL	MPI-NUCLEAR PHYS
OI - B.A. LINDBLAD	LUND OBS
OI - S. MORFILL	MPI-NUCLEAR PHYS
OI - H.A. ZOOK	NASA-JSC

BRIEF DESCRIPTION

THE PURPOSE OF THIS INVESTIGATION IS TO DETERMINE THE PHYSICAL AND DYNAMICAL PROPERTIES OF SMALL DUST PARTICLES IN THE JOVIAN ENVIRONMENT, WITH EMPHASIS ON THE INTERACTION OF DUST WITH THE MAGNETOSPHERE AND SATELLITE SURFACES. PARAMETERS MEASURED INCLUDE MASS, DIRECTION OF MOTION, AND CHARGE. THE INSTRUMENT PACKAGE CONSISTS OF ENTRANCE GRIDS FOR SENSING CHARGE, AN IMPACT PLASMA DETECTOR TO MEASURE PULSE HEIGHT AND RISE TIME FOR BOTH ELECTRONS AND IONS GENERATED BY IMPACT, AND APPROPRIATE ELECTRONICS. MASS AND VELOCITY ARE DERIVED FROM MEASUREMENTS BY EMPIRICAL RELATIONSHIPS DETERMINED IN GROUND-BASED CALIBRATIONS. THE IMPACT RATE RANGE IS 1.E-7 TO 1.E-2 PER SECOND, THE PARTICLE MASS RANGE IS 1.E-16 TO 1.E-6 G, AND THE CHARGE RANGE IS 1.E-14 TO 1.E-10 C. THE INSTRUMENT PACKAGE IS MOUNTED ON THE SPINNING SECTION OF THE ORBITER. ITS TOTAL MASS IS 4.2 KG, AND THE TOTAL POWER IS 1.7 W.

APPENDIX PAGE IS  
OF POOR QUALITY

----- GALILEO ORBITER, GURNETT -----

INVESTIGATION NAME- PLASMA WAVE SPECTROMETER

NSBDC ID- J0P0 -07 INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A. GURNETT	U OF IOWA
OI - R.G. GENDREN	CNET
OI - C.F. KERSEY	U OF CALIF., LA
OI - F.L. SCARF	TDR SYSTEMS GROUP
OI - S.B. SHANAHAN	U OF IOWA

BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO MEASURE THE VARYING ELECTRIC AND MAGNETIC FIELDS IN THE JOVIAN PLASMA IN ORDER TO DETERMINE THE CHARACTERISTICS AND ORIGIN OF PLASMA WAVES IN THE MAGNETOSPHERE AND TO ANALYZE VARIOUS WAVE-PARTICLE INTERACTION PHENOMENA IN THE MAGNETOSPHERE INTERACTIONS. THE INSTRUMENT PACKAGE INCLUDES A 2-M ELECTRIC DIPOLE ANTENNA FOR ELECTRIC FIELD MEASUREMENT AND TWO 27-CM SEARCH COIL MAGNETOMETERS, ONE FOR LOW FREQUENCY (LESS THAN 10 kHz) AND THE OTHER FOR HIGH FREQUENCY MAGNETIC FIELD MEASUREMENTS. THERE IS ALSO A 20-CHANNEL SPECTRUM ANALYZER COVERING THE RANGE 3.6 Hz TO 311 kHz, WITH 4 CHANNELS PER DECADE AND A HIGH DATA RATE WAVEFORM RECEIVER TO BE USED DURING SELECTED PERIODS. SENSORS ARE MOUNTED AS A SINGLE UNIT IN A DOOR APPROXIMATELY 2-M LONG ON THE SPINNING SECTION OF THE ORBITER. ELECTRONICS ARE MOUNTED NEAR THE BASE OF THE DOOR. THE TOTAL MASS OF THE PACKAGE IS 3.1 KG (1.2 K FOR THE SENSORS AND 1.9 KG FOR ELECTRONICS). THE TOTAL POWER IS 2.0 W.

----- GALILEO ORBITER, HU -----

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER (UVS)

NSBDC ID- J0P0 -02 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ULTRAVIOLET PHYSICS  
PLANETARY ATMOSPHERES

PERSONNEL

PI - C.N. HORD	U OF COLORADO
OI - C.A. BARTH	U OF COLORADO
OI - R.K. KELLY	U OF COLORADO
OI - A.L. LANE	NASA-JPL
OI - A.I. STEWART	U OF COLORADO
OI - G.E. THOMAS	U OF COLORADO

BRIEF DESCRIPTION

THIS INVESTIGATION STUDIES THE COMPOSITION AND STRUCTURE OF THE HIGH NEUTRAL ATMOSPHERES OF JUPITER AND THE GALILEAN SATELLITES TO DETERMINE ATMOSPHERIC LOSS RATES FROM SATELLITES, STUDY MIXING RATIOS ON JUPITER OF NH<sub>3</sub> AND OF UV-ACTIVE TRACE CONSTITUENTS, AND INVESTIGATE AURORAL EMISSIONS AND INTERACTIONS BETWEEN ATMOSPHERES AND THE JOVIAN PLASMAPAUSE. INSTRUMENTATION CONSISTS OF A FASTIE-EBERT UV SPECTROMETER (WAVELENGTH RANGE OF 110 TO 430 NANOMETERS) WITH A CASSEGRAIN TELESCOPE HAVING A 5-CM APERTURE, 25-CM FOCAL LENGTH, AND A FLUORIMMABLE GRATING. THE SPECTRUM IS MEASURED WITH MICROCHANNEL DETECTORS AT A FOV RESOLUTION OF 1.0 KM (1 NAUTICAL MILE) AT PERIAPEL. THE SPECTROMETER IS MOUNTED ON THE ORBITER SCAN PLATFORM AND HAS A TOTAL MASS OF 3.6 KG. THE TOTAL POWER IS 4.2 W.

----- GALILEO ORBITER, HUNTER -----

INVESTIGATION NAME- STRUCTURE AND AERODYNAMICS OF THE ATMOSPHERES OF JUPITER AND ITS SATELLITES

NSBDC ID- J0P0 -10 INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.P. HUNTER	U OF ARIZONA
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BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO STUDY THE HEAT BALANCE OF JUPITER'S ATMOSPHERE, TO ESTIMATE THE EDY DIFFUSION COEFFICIENTS IN THE ATMOSPHERE, AND TO STUDY THE AERODYNAMICS OF NEUTRAL AND IONIZED ATMOSPHERES (INCLUDING THOSE OF THE SATELLITES) BY USING DATA FROM A WIDE VARIETY OF PROBE AND ORBITER INSTRUMENTS.

----- GALILEO ORBITER, KIVELSON -----

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- JOPO -03

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
PLANETOLOGY  
MAGNETOSPHERIC PHYSICS  
IONOSPHERES

## PERSONNEL

PI - M.G. KIVELSON	U OF CALIF, LA
OI - P.J. COLEMAN, JR.	U OF CALIF, LA
OI - C.F. KENNELL	U OF CALIF, LA
OI - R.L. MCPHERRON	U OF CALIF, LA
OI - C.T. RUSSELL	U OF CALIF, LA

## BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO STUDY THE JOVIAN MAGNETIC FIELD IN ORDER TO MAP THE CONFIGURATION OF THE MAGNETOSPHERE AND ANALYZE ITS DYNAMICS; INVESTIGATE MAGNETOSPHERIC-IONOSPHERIC COUPLING; MEASURE MAGNETIC FLUCTUATIONS; SEARCH FOR MAGNETIC FIELDS ON THE SATELLITES; AND INVESTIGATE THE PROPERTIES OF THE SATELLITES AND THEIR INTERACTIONS WITH THE AMBIENT MEDIUM. THE INSTRUMENT PACKAGE INCLUDES DUAL TRIAXIAL FLUIGATE MAGNETOMETERS WITH A DYNAMIC RANGE OF 2.5E-12 TO 1.6E-5 TESLAS (0.0025 TO 1.6E-5 GAMMAS) MOUNTED ON A BOOM ON THE SPINNING PART OF THE ORBITER SPACECRAFT. EACH SENSOR TRIAD CAN BE MECHANICALLY FLIPPED ABOUT THE BOOM AXIS. OUTBOUND SENSORS ARE WOUND FOR LOW FIELD READINGS OF 1.E-12 TO 5.12E-7 TESLAS (1 MILLIGAMMA TO 512 GAMMAS). INBOUND SENSORS FOR HIGH FIELD READINGS OF 3.1E-11 TO 1.6E-5 TESLAS (31 MILLIGAMMAS TO 16 KILOGAMMAS). ELECTRONICS ARE MOUNTED ON THE SPINNING SECTION AND INCLUDE OPTIMUM AVERAGING CAPABILITY. THE MASS, EXCLUDING THE BOOM, IS 5.2 KG (1.0 FOR THE SENSORS, 2.2 FOR THE ELECTRONICS). THE TOTAL POWER IS 3.7 W.

-----  
INVESTIGATION NAME- PHOTOPOLARIMETER RADIOMETER

NSSDC ID- JOPO -08

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
PLANETARY ATMOSPHERES

## PERSONNEL

PI - A.A. LACIS	NASA-GISS
OI - D.L. COFFEEN	NASA-GISS
OI - J.E. HANSEN	NASA-GISS
OI - P.H. STONE	MASS INST OF TECH
OI - L. TRAVIS	NASA-GISS
OI - W.-C. WANG	NASA-GISS
OI - Y.L. YUNG	CALIF INST OF TECH

## BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION, PHOTOPOLARIMETER RADIOMETER (PPR), ARE TO DETERMINE THE CLOUD AND HAZE PROPERTIES (VERTICAL AND HORIZONTAL DISTRIBUTION AND MICROSTRUCTURE) AND RADIATION BUDGET (INCLUDING VERTICAL PROFILE OF SOLAR HEATING) OF JUPITER AND TO INVESTIGATE THE PHOTOMETRIC AND THERMAL PROPERTIES OF SATELLITE SURFACES. THE INSTRUMENT IS A 10-CM DALL-KIRKHAM TELESCOPE FOLLOWED BY A 16-POSITION FILTER WHEEL, GIVING POLARIMETRY IN THREE SPECTRAL BANDS FROM 410 TO 1050 NANOPMETERS AND PHOTOMETRY IN SEVEN SPECTRAL BANDS FROM 560 TO 890 NANOPMETERS. SILICON PHOTODIODES ARE USED FOR PHOTOPOLARIMETRY AND A THERMOPILE DETECTOR FOR RADIOMETRY. MEASUREMENT ACCURACY IS 0.1 PERCENT ABSOLUTE POLARIMETRY; 1 PERCENT RELATIVE PHOTOMETRY AND 5 PERCENT ABSOLUTE PHOTOMETRY; 1 PERCENT RELATIVE RADIOMETRY AND 5 PERCENT ABSOLUTE RADIOMETRY. THE INSTRUMENT IS MOUNTED ON THE ORBITER SCAN PLATFORM. THE TOTAL MASS IS 3.6 KG AND THE TOTAL POWER IS 7.5 W.

-----  
INVESTIGATION NAME- GEOLOGY OF THE GALILEAN SATELLITES

NSSDC ID- JOPO -15

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETOLOGY

## PERSONNEL

PI - H. MASURSKY	US GEOLOGICAL SURVEY
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## BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO USE ORBITER IMAGING AND NIMS DATA TO INVESTIGATE GEOLOGICAL PROCESSES ON THE GALILEAN SATELLITES, WITH EMPHASIS ON THE IDENTIFICATION AND DISTRIBUTION OF SURFACE MATERIALS, THE MORPHOLOGIES AND DENSITIES OF IMPACT CRATERS, AND THE SEARCH FOR STRUCTURE INDICATIVE OF GLACIAL AND PERIGLACIAL PROCESSES.

-----  
INVESTIGATION NAME- GALILEO ORBITER, MCELROY-----

INVESTIGATION NAME- INVESTIGATION OF THE JOVIAN UPPER ATMOSPHERE AND OF SATELLITE ATMOSPHERES

NSSDC ID- JOPO -16

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

## PERSONNEL

PI - M.B. MCELROY	HARVARD U
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## BRIEF DESCRIPTION

THIS INVESTIGATION USES DATA FROM A VARIETY OF PROBE AND ORBITER INVESTIGATIONS TO STUDY THE COMPOSITION AND STRUCTURE OF PLANETARY AND SATELLITE ATMOSPHERES, WITH EMPHASIS ON PHOTOCHEMISTRY AND INTERACTION OF THE ATMOSPHERES WITH THE MAGNETOSPHERE.

-----  
INVESTIGATION NAME- GALILEO ORBITER, ORTON-----

INVESTIGATION NAME- GROUND-TRUTH ANALYSIS OF RADIATIVE TRANSFER IN THE ATMOSPHERE OF JUPITER

NSSDC ID- JOPO -17

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

## PERSONNEL

PI - G.S. ORTON	NASA-JPL
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## BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO STUDY THE STRUCTURE OF THE ATMOSPHERE OF JUPITER USING DATA FROM THE PROBE STRUCTURE, COMPOSITION, NEPHELOMETER, AND NET-FLUX RADIOMETER INVESTIGATIONS, TOGETHER WITH ORBITER PHOTOPOLARIMETER/RADIOMETER AND NIMS REMOTE SENSING DATA. RESULTS INCLUDE AN ANALYSIS OF RADIATIVE EQUILIBRIUM IN THE UPPER TROPOSPHERE AND STRATOSPHERE AND AN ASSESSMENT OF THE INFORMATION REQUIRED IN GENERAL FOR SUCCESSFUL REMOTE RECOVERY OF ATMOSPHERIC CONDITIONS ON THE OUTER PLANETS.

-----  
INVESTIGATION NAME- GALILEO ORBITER, OWEN-----

INVESTIGATION NAME- COMPOSITION OF THE JOVIAN ATMOSPHERE

NSSDC ID- JOPO -18

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

## PERSONNEL

PI - T. OWEN	STATE U OF NEW YORK
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## BRIEF DESCRIPTION

THIS INVESTIGATION IS BASED ON DATA FROM THE MASS SPECTROMETER AND HELIUM INTERFEROMETER INVESTIGATIONS AND THE NIMS AND OTHER ORBITER INVESTIGATIONS TO ESTABLISH A DIRECT CALIBRATION OF PREVIOUS REMOTE MEASUREMENTS OF THE COMPOSITION OF JUPITER BY VOYAGER IRIS AND EARTH-BASED SPECTROSCOPIC OBSERVATIONS.

-----  
INVESTIGATION NAME- GALILEO ORBITER, POLLACK-----

INVESTIGATION NAME- THERMAL AND DYNAMICAL PROPERTIES OF THE JOVIAN ATMOSPHERE

NSSDC ID- JOPO -19

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

## PERSONNEL

PI - J.B. POLLACK	NASA-ARC
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## BRIEF DESCRIPTION

THE PURPOSE OF THIS INVESTIGATION IS TO DETERMINE THE VERTICAL TEMPERATURE STRUCTURE AND DYNAMICS OF THE JOVIAN ATMOSPHERE USING DATA FROM ALL OF THE PROBE INVESTIGATIONS TO CHARACTERIZE THE ROLES OF RADIATIVE HEATING, THERMAL CONVECTION, LATENT HEAT RELEASE, AND THE INTERNAL ENERGY SOURCE.

-----  
INVESTIGATION NAME- GALILEO ORBITER, RUSSELL-----

INVESTIGATION NAME- JUPITER MAGNETOSPHERE AND SATELLITE MAGNETOSPHERE INTERACTIONS

NSSDC ID- JOPO -20

INVESTIGATIVE PROGRAM  
CODE SLINVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
INTERPLANETARY PHYSICS

**PERSONNEL**  
PI - C.T. RUSSELL

U OF CALIF, LA

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES DATA FROM THE ORBITER MAGNETOMETER, PLASMA, PLASMA WAVE, AND ENERGETIC PARTICLES INVESTIGATIONS TO: (1) STUDY THE JOVIAN MAGNETOSPHERE AND SATELLITE-MAGNETOSPHERE INTERACTIONS (WITH EMPHASIS ON REFINING MODELS OF THE JOVIAN MAIN FIELD); (2) STUDY THE INTERNAL STRUCTURE OF THE GALILEAN SATELLITES FROM THEIR INTERACTIONS WITH THE AMBIENT MEDIUM; (3) INVESTIGATE THE DYNAMICS OF THE MAGNETOSPHERE; AND (4) EXAMINE CRITICALLY THE OBSERVATIONAL DATA PERTAINING TO ENERGETIC PARTICLE TRANSPORT, ACCELERATION, AND LOSS IN THE JOVIAN MAGNETOSPHERE.

----- GALILEO ORBITER, SAGAN-----

**INVESTIGATION NAME-** ORGANIC CHEMISTRY OF THE JOVIAN ATMOSPHERE

NSSDC ID- JOP0 -21

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

**PERSONNEL**  
PI - C. SAGAN

CORNELL U

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES DATA FROM THE ORBITER NIMS AND UVS INVESTIGATIONS, TOGETHER WITH THE PROBE COMPOSITION AND NEPHELOMETER INVESTIGATIONS, TO STUDY THE ORGANIC CHEMISTRY OF THE JOVIAN ATMOSPHERE, WITH EMPHASIS ON THE NATURE OF THE ORGANIC AND INORGANIC CHROMOPHORES THAT PRODUCE THE COLORS OF THE JOVIAN CLOUDS.

----- GALILEO ORBITER, SCARF-----

**INVESTIGATION NAME-** WAVE-PARTICLE INTERACTION PHENOMENA AT JUPITER

NSSDC ID- JOP0 -22

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

**PERSONNEL**  
PI - F.L. SCARF

TRW SYSTEMS GROUP

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES MAGNETOSPHERIC DATA FROM THE ORBITER PLASMA, PLASMA WAVE, AND ENERGETIC PARTICLE INVESTIGATIONS TO STUDY WAVE-PARTICLE INTEGRATION PHENOMENA, WITH EMPHASIS ON EVALUATING THE EFFECTIVE TRANSPORT COEFFICIENTS (ANOMALOUS CONDUCTIVITY, PITCH-ANGLE DIFFUSION COEFFICIENT, ETC.) ASSOCIATED WITH THE MAGNETOSPHERIC PLASMA INSTABILITIES AND SATELLITE-MAGNETOSPHERE INTERACTIONS.

----- GALILEO ORBITER, SCHUBERT-----

**INVESTIGATION NAME-** JOVIAN ATMOSPHERIC STRUCTURE AND CIRCULATION

NSSDC ID- JOP0 -23

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES

**PERSONNEL**  
PI - G. SCHUBERT

U OF CALIF, LA

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES DATA FROM THE ORBITER IMAGING INVESTIGATION AND FROM ALL OF THE PROBE INVESTIGATIONS TO STUDY THE THERMAL AND DYNAMICAL PROCESSES RESPONSIBLE FOR THE GLOBAL ATMOSPHERIC CIRCULATION OF JUPITER AND THE WAYS THAT THESE PROCESSES ARE INFLUENCED BY THE STRUCTURE OF THE CLOUD LAYERS.

----- GALILEO ORBITER, SONETT-----

**INVESTIGATION NAME-** INTERACTION OF GALILEAN SATELLITE MAGNETIC PROPERTIES-JOVIAN MAGNETOSPHERE

NSSDC ID- JOP0 -24

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS  
INTERPLANETARY PHYSICS

**PERSONNEL**  
PI - E.P. SONETT

U OF ARIZONA

**BRIEF DESCRIPTION**

THE PURPOSES OF THIS INVESTIGATION ARE TO USE DATA FROM THE ORBITER MAGNETOMETER, PLASMA, AND PLASMA WAVE INVESTIGATIONS TO MEASURE ANY INTRINSIC MAGNETIC FIELDS THAT MAY EXIST ON THE GALILEAN SATELLITES AND TO INVESTIGATE THE PROCESSES WHEREBY THESE SATELLITES INTERACT WITH THE MAGNETOSPHERE AND MAIN FIELD OF JUPITER, INCLUDING COMPARISONS TO SIMILAR INTERACTIONS INVOLVING THE MOON.

----- GALILEO ORBITER, WILLIAMS-----

**INVESTIGATION NAME-** ENERGETIC PARTICLES

NSSDC ID- JOP0 -06

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

**PERSONNEL**

PI - D.J. WILLIAMS	NOAA-ERL
OI - T.P. ARMSTRONG	U OF KANSAS
OI - T.A. FRITZ	NOAA-ERL
OI - S.M. KRIMIGIS	APPLIED PHYSICS LAB
OI - L.J. LANZEROTTI	BELL TELEPHONE LAB
OI - R.W. MCENTIRE	APPLIED PHYSICS LAB
OI - J.G. ROEDERER	U OF ALASKA
OI - E.C. ROEOF	APPLIED PHYSICS LAB
OI - W. STUBERMAN	MPI-AERONAUTY
OI - B. WILKEN	MPI-AERONAUTY

**BRIEF DESCRIPTION**

THE PURPOSES OF THIS INVESTIGATION ARE TO: STUDY THE DETAILED ENERGY AND ANGULAR DISTRIBUTION AND STABILITY OF TRAPPED PROTONS, ELECTRONS, AND IONS AND DETERMINE ION COMPOSITIONS; INVESTIGATE THE INTERACTIONS OF THESE PARTICLES WITH THE SATELLITES AND THE SOLAR WIND; MEASURE THERMAL PLASMA FLOW VELOCITIES AND TEMPERATURES; AND INVESTIGATE ADIABATIC AND NONTHERMAL PROCESSES IN THE TRAPPED RADIATION. THE INSTRUMENT PACKAGE CONSISTS OF A LOW-ENERGY MAGNETOSPHERIC MEASUREMENT SYSTEM (LEMS), A COMPOSITION MEASUREMENT SYSTEM (CMS), AND AN INSTRUMENT STEPPING PLATFORM. THE LEAMS ENERGY RANGE AND CHARGE RESPONSE (MAGNETIC DEFLECTION AND DE/DX, E TECHNIQUES) ARE, FOR ELECTRONS, 0.015 - 31 MEV, AND 0.02 - 55 MEV/NUCLEON FOR PROTONS AND IONS. THE CMS ENERGY RANGE AND CHARGE RESPONSE (DE/DX, E, TIME OF FLIGHT, AND PULSE HEIGHT ANALYSIS TECHNIQUES) MEASURES HE THROUGH FE WITH VARYING ENERGY RESPONSES IN THE 0.15 - 100 MEV/NUCLEON RANGE. THE INSTRUMENT PACKAGE IS MOUNTED ON THE SPINNING SECTION OF THE ORBITER. THE TOTAL MASS IS 7.4 KG AND THE TOTAL POWER IS 7.4 W.

\*\*\*\*\* GALILEO PROBE\*\*\*\*\*

**SPACECRAFT COMMON NAME-** GALILEO PROBE  
ALTERNATE NAMES- JUPITER ORBITER PROBE, JOP  
GALILEO

NSSDC ID- JOP

LAUNCH DATE- 03/22/84  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- JUPITER PROBE

PERSONNEL	
MG - D.R. McCULLAN	NASA HEADQUARTERS
SC - R.E. MURPHY	NASA HEADQUARTERS
PM - J. CASANI	NASA-JPL
PR - J. SPERANS	NASA-ARC
PS - L. COLIN	NASA-ARC
PS - T.V. JOHNSON	NASA-JPL

**BRIEF DESCRIPTION**

THE PROBE IS A STAGED-VENTED SYSTEM COMPRISING OF A DECELERATION MODULE AND A DESCENT MODULE. IT WILL BE LAUNCHED FROM THE SHUTTLE WITH THE IUS SEPARATELY FROM THE ORBITER. ITS MASS AND DIAMETER ARE 250 KG AND 1.2 M, RESPECTIVELY. THE DECELERATION MODULE CONSISTS OF STRUCTURE AND HEAT SHIELDS. THE DESCENT MODULE CONTAINS THE SCIENCE INSTRUMENTS, PROBE ELECTRONICS AND POWER SOURCES ARE VENTED TO THE JOVIAN ATMOSPHERE. A PARACHUTE IS USED TO SEPARATE THE DESCENT MODULE FROM THE DECELERATION MODULE AND TO CONTROL THE PROBE DESCENT RATE. IT MAY BE JETTISONED NEAR THE TERMINATION OF THE MISSION (AT A PRESSURE OF 10 BARS) TO ALLOW A MORE RAPID DESCENT AT THE HIGHER PRESSURES AND TEMPERATURES. IN SITU SCIENCE MEASUREMENTS ARE MADE PRIOR TO AND DURING HIGH SPEED ENTRY AND DESCENT. POWER IS SUPPLIED BY A BATTERY. DATA ARE TELEMETERED TO THE ORBITER, WHICH IN TURN RELAYS THEM TO EARTH. THE IN SITU MEASUREMENTS GIVE INFORMATION ON THE PHYSICAL STRUCTURE, CHEMICAL COMPOSITION, LOCATION OF CLOUDS IN THE TROPOSPHERE, AND THE THERMAL BALANCE OF THE PLANET. DATA ARE STORED IN A MEMORY UNIT FOR THE PERIOD OF COMMUNICATION BLACKOUT DURING ENTRY THEN TRANSMITTED TO THE ORBITER INTERLEAVED WITH REAL-TIME DATA.

----- GALILEO PROBE, BOESE -----

INVESTIGATION NAME- NET FLUX RADIOPETER

NSSDC ID- JOP -04

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
PLANETOLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.W. BOESE	NASA-ARC
OI - J.B. POLLACK	NASA-ARC
OI - P.M. SILVAGGIO	NASA-ARC

BRIEF DESCRIPTION

THE PURPOSES OF THIS INVESTIGATION ARE TO: (1) MEASURE VERTICAL DISTRIBUTION OF NET FLUX OF SOLAR ENERGY AND PLANETARY EMISSION IN THE REGION OF THE ATMOSPHERE FROM 0.1 TO 10 BARS, (2) DETERMINE THE LOCATION OF CLOUD LAYERS, AND (3) OBTAIN EVIDENCE ON THE MIXING RATIOS OF SELECTED CONSTITUENTS AND THE OPACITY OF CLOUDS AND AEROSOLS IN THE INFRARED. A MULTICHANNEL RADIOMETER MEASURES FLUX IN ABOUT 30-BEG CONES ALTERNATELY CENTERED PLUS OR MINUS 45 DEG FROM THE PROBE HORIZONTAL. IT HAS AN ON-BOARD CALIBRATION SYSTEM (2 BLACK BODIES), A MULTIDETECTOR ARRAY (WITH CHANNELS AT APPROXIMATELY 0.3 - 3.0, 0.3 - 2000, 20-30, 30-40, AND 40 - 60 MICROMETERS), AND A SIX PYROELECTRIC DETECTOR ARRAY. IT IS MOUNTED ON THE PROBE WITH EXTERNAL VIEWING AFTER SHIELD DEPLOYMENT. THE TOTAL MASS IS 2.3 KG AND THE TOTAL POWER IS 4.6 W.

----- GALILEO PROBE, LANZEROTTI -----

INVESTIGATION NAME- LIGHTNING

NSSDC ID- JOP -06

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
SPACE PLASMAS  
PLANETARY MAGNETIC FIELD

PERSONNEL

PI - L.J. LANZEROTTI	BELL TELEPHONE LAB
OI - G. BEHML	BRAUNSCHWEIG TECH U
OI - F.O. GLEIM	BRAUNSCHWEIG TECH U
OI - E.P. KRIDER	U OF ARIZONA
OI - K. RINNERT	MPI-AERONOMY
OI - M. UMAN	U OF FLORIDA

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) VERIFY THE EXISTENCE OF LIGHTNING ON JUPITER AND MEASURE ITS BASIC PHYSICAL CHARACTERISTICS, AND (2) MEASURE RF NOISE LEVELS AND ONE MAGNETIC FIELD COMPONENT NEAR JUPITER. TWO INSTRUMENTS ARE USED FOR THIS INVESTIGATION - AN ELECTROMAGNETIC SENSOR AND AN OPTICAL SENSOR. THE ELECTROMAGNETIC SENSOR HAS A FERRITE CORE ANTENNA WITH A PREAMPLIFIER AS AN RF SENSOR. THE FREQUENCY DOMAIN IS 3, 15, AND 100 KHZ NARROW-BAND. THE TIME DOMAIN IS 1 HZ TO 100 ... 16, AND THE RESOLUTION IS 16 S. THE OPTICAL SENSOR HAS A PHOTODIODE WITH FISHEYE LENS. THERE IS COINCIDENCE AND ANTICOINCIDENCE BETWEEN THE RF AND OPTICAL SENSORS. THE ELECTROMAGNETIC SENSOR IS MOUNTED UNDER THE PROBE AFTER BODY WHILE THE OPTICAL SENSOR IS MOUNTED ON THE PROBE ENVELOPE LOOKING OUT PERPENDICULAR TO THE PROBE SPIN AXIS. THE TOTAL MASS IS 1.1 KG AND THE TOTAL CONTINUOUS POWER IS 1.0 W.

----- GALILEO PROBE, NIEMANN -----

INVESTIGATION NAME- MASS SPECTROSCOPE

NSSDC ID- JOP -03

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES

PERSONNEL

PI - H.B. NIEMANN	NASA-GSFC
OI - S.K. ATREYA	U OF MICHIGAN
OI - G.R. CARIGNAN	U OF MICHIGAN
OI - T.M. DONAHUE	U OF MICHIGAN
OI - R.E. HARTLE	NASA-GSFC
OI - D.R. HUNTER	U OF ARIZONA
OI - T. OWEN	STATE U OF NEW YORK
OI - N.W. SPENCER	NASA-GSFC

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO DETERMINE THE CHEMICAL AND ISOTOPIC COMPOSITION AND PHYSICAL STATE OF THE JOVIAN ATMOSPHERE, INCLUDING VERTICAL VARIATIONS FROM 0.1 TO 10 BARS OR GREATER. MIXING RATIOS ARE DETERMINED OF HE TO ONE PERCENT ACCURACY AND OF H<sub>2</sub>O, CH<sub>4</sub>, AND NH<sub>3</sub> TO FIVE PERCENT ACCURACY. THE ISOTOPIC RATIO OF NE20 TO NE22 IS MEASURED TO AN ACCURACY OF TWO PERCENT. ALL SPECIES WITH MASS NUMBERS 1-52, PLUS SELECTED SPECIES AT HIGHER MASS NUMBERS (INCLUDING KRYPTON AND XENON) ARE MEASURED. THE INSTRUMENT IS A QUADRUPOLE MASS SPECTROMETER WITH AN ELECTRON IMPACT ION SOURCE HAVING REDUNDANT ELECTRON BEAM GUNS OF VARIABLE KINETIC ENERGY AND A SECONDARY ELECTRON MULTIPLIER ION DETECTOR. THE DUAL-CHANNEL SAMPLE INLET SYSTEM INCLUDES AN ENRICHMENT SYSTEM FOR TRACE GAS

AND ISOTOPE DETERMINATION, A TANDEM GETTER, AND A SPITTER ION PUMP. THE MASS RANGE IS 1-52, 80, AND 131 U. THE DYNAMIC RANGE IS 1,E+8. OTHER SPECIES WITH MASSES GREATER THAN 52 CAN BE SOUGHT AT THE SACRIFICE OF INTEGRATION TIME BELOW 52 U. THE SCAN PERIOD IS 3 TO 60 S. THE INSTRUMENT IS MOUNTED ON THE PROBE WITH THE SAMPLE INLET PORT NEAR THE STAGNATION POINT WITH THE SAMPLE CUTLET PORT NEAR THE MINIMUM PRESSURE POINT. THE TOTAL MASS IS 7.1 KG AND THE TOTAL POWER IS 15 W.

----- GALILEO PROBE, RAGENT -----

INVESTIGATION NAME- NEPHELOMETER

NSSDC ID- JOP -05

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - B. RAGENT	NASA-ARC
OI - J.E. BLAMONT	CNR-SA
OI - G.W. CRAMS	GEORGIA INST OF TECH
OI - J.B. POLLACK	NASA-ARC

BRIEF DESCRIPTION

THIS INVESTIGATION IS TO DETERMINE VERTICAL EXTENT, STRUCTURE, AND MICROPHYSICAL CHARACTERISTICS (PARTICLE SIZE DISTRIBUTION, NUMBER DENSITY, AND PHYSICAL STRUCTURE) OF JUPITER'S CLOUDS OVER THE RANGE 0.1 TO 10 BARS. A SINGLE-WAVELENGTH, MULTIPLE-ANGLE (5) SCATTERING NEPHELOMETER, WITH A GALLIUM-ARSENIC LED (9800 A) SOURCE AND SOLID STATE DETECTORS, IS MOUNTED ON THE PROBE WITH APPROPRIATE EXTERNAL VIEWING GEOMETRY. DEPLOYMENT TAKES PLACE AFTER THE HEAT SHIELD IS REMOVED. THE TOTAL MASS IS 1.8 KG AND THE TOTAL CONTINUOUS POWER IS 3.0 W.

----- GALILEO PROBE, SIEFF -----

INVESTIGATION NAME- ATMOSPHERIC STRUCTURE

NSSDC ID- JOP -02

INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES

PERSONNEL

PI - A. SIEFF	NASA-ARC
OI - R.C. BLANCHARD	NASA-ARC
OI - D.B. KIRK	NASA-ARC
OI - G. SCHUBERT	U OF CALIF, LA
OI - S.C. SOMMER	NASA-ARC
OI - R.E. YOUNG	NASA-ARC

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO DETERMINE STATE PROPERTY PROFILES (TEMPERATURE, PRESSURE, DENSITY, MOLECULAR WEIGHT) OVER AN ALTITUDE RANGE FROM A THRESHOLD OF ABOUT 1000 KM ABOVE THE CLOUD DECK DOWN TO PROBE FAILURE (DEEPER THAN 10 BAR PRESSURE). THE INSTRUMENT PACKAGE CONSISTS OF ACCELERATION, TEMPERATURE, AND PRESSURE SENSORS AND ASSOCIATED ELECTRONICS. THEY ARE MOUNTED IN THE PROBE WITH ACCELEROMETERS NEAR THE PROBE CENTER OF GRAVITY. THE TEMPERATURE SENSING HEAD AND PRESSURE INLET ARE DEPLOYED OUTSIDE THE PROBE BOUNDARY LAYER. THE TOTAL MASS IS 1.9 KG AND THE TOTAL CONTINUOUS POWER IS 5.5 W.

----- GALILEO PROBE, VON ZAHN -----

INVESTIGATION NAME- HELIUM ABUNDANCE INTERFEROMETER

NSSDC ID- JOP -01

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES

PERSONNEL

PI - U. VON ZAHN	U OF BONN
OI - H.-J. HOFFMAN	U OF BONN

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS THE PRECISE (0.1 PERCENT) DETERMINATION OF THE HELIUM ABUNDANCE IN THE JOVIAN ATMOSPHERE FROM 3 TO 8 BARS. A TWO-ARM DOUBLE PATHLENGTH OPTICAL INTERFEROMETER THAT INCLUDES AN IR LIGHT-EMITTING DIODE (LED) LIGHT SOURCE, AN INTERFERENCE FILTER, AND A PHOTODETECTOR ARRAY IS USED TO MEASURE THE REFRACTIVE INDEX DIFFERENCE BETWEEN AN ATMOSPHERE SAMPLE AND A REFERENCE GAS MIXTURE. IT IS MOUNTED ON THE PROBE WITH AN INLET PIPE TO THE AMBIENT ATMOSPHERE. THE TOTAL MASS IS 1.0 KG AND THE TOTAL CONTINUOUS POWER IS 0.7 W.

\*\*\*\*\* GAMMA-RAY OBSERVATORY \*\*\*\*\*

SPACECRAFT COMMON NAME - GAMMA-RAY OBSERVATORY  
ALTERNATE NAMES -

NSSDC ID - GRO

LAUNCH DATE - 08/01/89 WEIGHT - 12000. KG  
LAUNCH SITE - CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE - SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS

ORBIT TYPE - GEOCENTRIC  
ORBIT PERIOD - 92.5 MIN  
PERIAPSIS - 400. KM ALT

INCLINATION - 28.5 DEG  
APOAPSIS - 400. KM ALT

PERSONNEL  
PI - D.R. BURROUGHS  
SC - A.G. OPP  
PM - J.J. RADDEN  
PS - D.A. KNIFFEN

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE GRO IS DESIGNED AS A FREE-FLYING SATELLITE LAUNCHED FROM THE SPACE SHUTTLE, CARRYING FIVE GAMMA-RAY INSTRUMENTS THAT REQUIRE SUSTAINED POINTING TOWARD GAMMA-RAY SOURCES IN SPACE. THE SPACECRAFT IS STABILIZED IN THREE AXES. GRO IS SUPPORTED BY A MECHANICAL STRUCTURE WHICH, IN ADDITION TO THE SCIENTIFIC INSTRUMENTS, HOUSES AN ATTITUDE-CONTROL SYSTEM, A POWER SYSTEM, AND A COMMAND AND COMMUNICATIONS SYSTEM. ALL THE MAIN SUBSYSTEMS ARE REDUNDANT FOR INCREASED RELIABILITY OF THE MISSION. THE PLANNED OPERATING LIFE IN ORBIT IS 2 YEARS. DATA WILL BE RETRIEVED THROUGH THE TDSS.

\*\*\*\*\* GAMMA-RAY OBSERVATORY, FICHTEL\*\*\*\*\*

INVESTIGATION NAME - HIGH-ENERGY GAMMA-RAY TELESCOPE

NSSDC ID - GRO -04 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - C.E. FICHTEL  
PI - R. HOFSTADTER  
PI - K. PINKAU  
OI - D.L. BERTSCH  
OI - A.J. FAFALE  
OI - R.C. HARTMAN  
OI - E.B. HUGHES  
OI - D.A. KNIFFEN  
OI - H.A. MAYER-HASSELWANDER  
OI - H. ROTHERMEL  
OI - E.J. SCHNEID  
OI - M.K. SOMMER  
OI - D.B. THOMPSON

NASA-GSFC  
STANFORD U  
MPI-EXTRATERR PHYS  
NASA-GSFC  
GRUMMAN AEROSPACE CORP  
NASA-GSFC  
STANFORD U  
NASA-GSFC  
MPI-EXTRATERR PHYS  
MPI-EXTRATERR PHYS  
GRUMMAN AEROSPACE CORP  
MPI-EXTRATERR PHYS  
NASA-GSFC

BRIEF DESCRIPTION

THE INSTRUMENT IS A PICTORIAL-TYPE TELESCOPE USING A DIGITIZED SPARK CHAMBER TO IDENTIFY THE ELECTRON PAIR PRODUCED BY A GAMMA-RAY INTERACTION, AND A LARGE NAI (TL) SCINTILLATOR CRYSTAL TO DETERMINE THE GAMMA-RAY ENERGY. THE SPECIFIC OBJECTIVES OF THE EXPERIMENT ARE: (1) TO SEARCH FOR LOCALIZED SOURCES (E.G., NEUTRON STARS, BLACK HOLES) IN THE 20 MEV-30 GEV RANGE AND STUDY THEIR PROPERTIES, (2) TO IMPROVE LOCATION ACCURACY OF KNOWN SOURCES, (3) TO SEARCH FOR EVIDENCE OF COSMIC-RAY PARTICLE ACCELERATION IN SUPERNOVA REMNANTS, (4) TO STUDY GAMMA-RAY BURSTS AND LINE EMISSION FROM SOLAR FLARES, (5) TO OBTAIN A DETAILED PICTURE OF THE DIFFUSE GAMMA-RAY EMISSION FROM OUR GALAXY, AND STUDY GALACTIC DYNAMICS, COSMIC-RAY COMPOSITION, AND MAGNETIC FIELDS, (6) TO STUDY OTHER GALAXIES, BOTH NORMAL AND PECULIAR, AND (7) TO STUDY THE DIFFUSE CELESTIAL RADIATION AS IT RELATES TO COSMOLOGY.

\*\*\*\*\* GAMMA-RAY OBSERVATORY, FISHMAN\*\*\*\*\*

INVESTIGATION NAME - TRANSIENT-EVENT MONITOR

NSSDC ID - GRO -05 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - G.J. FISHMAN  
OI - C.A. MEEGAN  
OI - T.A. PARRELL

NASA-MSFC  
NASA-MSFC  
NASA-MSFC

BRIEF DESCRIPTION

THE DETECTOR ARRAY OF THE TRANSIENT EVENT MONITOR PROVIDES DEFINITIVE DATA ON: (1) DISTRIBUTION OF BURST SIZES (LOG N - LOG S CURVE) DOWN TO 6.0E-15 J/SQ CM, (2) THE PRECISE DIRECTION OF MANY SOURCES THROUGH INTERPLANETARY TIMING, (3) THE GENERAL LOCATION OF NUMEROUS ADDITIONAL BURST SOURCES, AND (4) FLUCTUATIONS AND SPECTRAL CHANGES ON TIME SCALES OF 1 MS OR LESS. THESE DATA NOT ONLY CONSTRAIN THEORIES OF BURST SOURCES AND THEIR EMISSION MECHANISM, BUT MAY PROVIDE IDENTIFICATIONS

WITH OPTICAL OR X-RAY OBJECTS. THIS EXPERIMENT CONSISTS OF SIX 40-CM-DIAMETER, 1.27-CM THICK NAI (TL) DISCS WITH ANTI-COINCIDENCE SHIELDS.

\*\*\*\*\* GAMMA-RAY OBSERVATORY, KURFESS\*\*\*\*\*

INVESTIGATION NAME - SCINTILLATION SPECTROMETER

NSSDC ID - GRC -02 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - J.D. KURFESS  
OI - M. ULMER  
OI - W.N. JOHNSON  
OI - R.L. KINZER  
OI - G.H. SHARE  
OI - C. DYER  
OI - D.B. CLAYTON

US NAVAL RESEARCH LAB  
NORTHWESTERN U  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
ROYAL NAVAL COLLEGE  
RICE U

BRIEF DESCRIPTION

THE INSTRUMENT IS COMPRISED OF FOUR IDENTICAL HIGH-SENSITIVITY SCINTILLATION DETECTORS THAT ARE INDEPENDENTLY MOUNTED ON ONE-AXIS ORIENTATION SYSTEMS. FOR MOST OBSERVATIONS, TWO DETECTORS ARE POINTED AT THE SOURCE, WHILE THE OTHER TWO ARE OFFSET BY 15 DEG FOR SIMULTANEOUS BACKGROUND MEASUREMENTS. FOR TIME-VARIABLE PHENOMENA, ALL FOUR DETECTORS CAN BE POINTED AT THE SOURCE FOR MAXIMUM SENSITIVITY. OF PARTICULAR INTEREST ARE OBSERVATIONS OF NUCLEAR LINE RADIATION FROM SUPERNOVAE, NOVAE, NEUTRON STARS, ACCRETION ONTO BLACK HOLES, SOLAR FLARES AND CONTINUUM RADIATION FROM ALL OF THE ABOVE, PLUS SEYFERT GALAXIES, QUASARS, PULSARS, X-RAY BURSTERS, AND KNOWN HIGH-ENERGY GAMMA-RAY SOURCES. TRANSIENT PHENOMENA OCCURRING ANYWHERE IN THE SKY CAN BE DETECTED.

\*\*\*\*\* GAMMA-RAY OBSERVATORY, PETERSON\*\*\*\*\*

INVESTIGATION NAME - GAMMA-RAY SPECTROSCOPY

NSSDC ID - GRO -01 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - L.E. PETERSON  
OI - P. BURDOUCHOUX  
OI - R. ROCCHIA  
OI - K.C. HURLEY  
OI - M. NIEL  
OI - G. VEDRENNE  
OI - T.L. CLINE  
OI - R. RAMATY  
OI - B.J. TEEGARDEN  
OI - A.S. JACOBSON  
OI - W.A. MAHONEY  
OI - G.R. RIEGLER  
OI - L. KOCH  
OI - J.L. MATTESON  
OI - M. LEVENTHAL  
OI - C.J. MACCALLUM

U OF CALIF. SAN DIEGO  
CENS  
CENS  
CESR  
CESR  
CESR  
NASA-GSFC  
NASA-GSFC  
NASA-JPL  
NASA-JPL  
NASA-JPL  
CENS  
U OF CALIF. SAN DIEGO  
BELL TELEPHONE LAB  
SANDIA LABORATORIES

BRIEF DESCRIPTION

GAMMA RAYS ARE DETECTED IN THE ENERGY RANGE FROM 0.5 TO 10 MEV, BY A MOSAIC OF 18 COOLED HIGH-PURITY GERMANIUM SOLID-STATE COUNTERS. THE OBSERVATIONAL OBJECTIVES ARE: (1) MEASUREMENT OF GAMMA-RAY LINE INTENSITIES AND THEIR TIME EVOLUTION FROM DISCRETE GALACTIC AND EXTRAGALACTIC SOURCES, (2) MEASUREMENT OF SPECTRA AND TIME VARIATIONS OF CONTINUUM EMISSION FROM THESE AND OTHER DISCRETE SOURCES, (3) MEASUREMENT OF TRANSIENT LINE AND CONTINUUM EMISSION DUE TO TIME-VARYING PHENOMENA FROM OBJECTS SUCH AS X-RAY AND GAMMA-RAY BURST SOURCES AND PULSARS, (4) DETERMINATION OF THE EXTENT AND LUMINOSITY OF LINE AND CONTINUUM EMISSION FROM THE GALACTIC PLANE, AND (5) MEASUREMENT OF THE LINE AND CONTINUUM SPECTRA OF THE DIFFUSE COSMIC BACKGROUND. THESE OBSERVATIONS SHOULD BE USEFUL IN UNDERSTANDING ACCELERATION OF NUCLEONS AND ELECTRONS IN COSMIC PLASMAS, NUCLEOSYNTHESIS AND SUPERNOVA EXPLOSIONS, ORIGIN AND PROPAGATION OF COSMIC RAYS IN OUR GALAXY, AND THE NATURE OF COMPACT STELLAR OBJECTS AND GALACTIC NUCLEI.

\*\*\*\*\* GAMMA-RAY OBSERVATORY, SCHONFELDER\*\*\*\*\*

INVESTIGATION NAME - IMAGING COMPTON TELESCOPE

NSSDC ID - GRO -05 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - V. SCHONFELDER  
OI - B.N. SWANENBURG  
OI - J.A. LOCKWOOD  
OI - B.G. TAYLOR  
OI - G. KAMBACH  
OI - F. MELZNER  
OI - J.A.M. BLEEKER  
OI - A.J.M. DEERENBERG

MPI-EXTRATERR PHYS  
U OF LEIDEN  
U OF NEW HAMPSHIRE  
ESA-ESTEC  
MPI-EXTRATERR PHYS  
MPI-EXTRATERR PHYS  
U OF LEIDEN  
U OF LEIDEN

ORIGINAL PAGE IS  
OF POOR QUALITY

PI - W. HERMSEN  
PI - W.D. WEBER  
PI - K. BENNETT  
PI - R.B. WILLS

U OF LEIDEN  
U OF NEW HAMPSHIRE  
ESA-ESTEC  
ESA-ESTEC

BRIEF DESCRIPTION

THE INVESTIGATION EMPLOYS AN IMAGING COMPTON TELESCOPE THAT COVERS THE 1-TO 30-MEV ENERGY RANGE. THIS INSTRUMENT IS ABLE TO OVERCOME BACKGROUND PROBLEMS AND PROVIDE UNPRECEDENTED SENSITIVITY AND SPATIAL RESOLUTION. THE SCIENTIFIC OBJECTIVES OF THIS EXPERIMENT ARE: (1) STUDY OF INTENSITIES, SPECTRA, SPATIAL DISTRIBUTION OF LOCALIZED SOURCES TO AN INTENSITY ABOUT 1/50 OF THE CRAB NEBULA, (2) STUDY OF THE DIFFUSE GALACTIC EMISSION IN THE ENERGY RANGE WHERE ELECTROMAGNETIC PROCESSES ARE EXPECTED TO DOMINATE, (3) STUDY OF THE DIFFUSE COSMIC EMISSION, AND (4) STUDY OF BROADENED LINE EMISSION FROM EXCITED NUCLEI IN THE DIFFUSE GALACTIC EMISSION AND FROM LOCALIZED SOURCES, INCLUDING THE SUN, USING THE 1-50-M EV DETECTORS WITH AN ENERGY RESOLUTION OF ABOUT 10 PERCENT.

\*\*\*\*\* GMS-2 \*\*\*\*\*

SPACECRAFT COMMON NAME- GMS-2  
ALTERNATE NAMES- GEOSTATION.METEORO.SAT.2

NSSDC ID- GMS-2

LAUNCH DATE- 08/00/81 WEIGHT- 647. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
JAPAN NASDA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN INCLINATION- 28.5 DEG  
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL

PM - N. KODAIRA  
PS - JMA STAFF

METEORO SATELLITE CTR  
JAPANESE METEORO AGCY

BRIEF DESCRIPTION

THE GEOSTATIONARY METEOROLOGICAL SATELLITES (GMS) ARE JAPAN'S CONTRIBUTION TO THE INTERNATIONAL GARP (GLOBAL ATMOSPHERIC RESEARCH PROGRAM). ONE MAJOR OBJECTIVE OF GARP WAS TO OBTAIN SYNOPTIC GLOBAL METEOROLOGICAL DATA SETS FOR ONE YEAR'S DURATION (TO INCLUDE TWO OPTIMIZED OBSERVING PERIODS OF A FEW WEEKS EACH). THESE DATA WILL CONTINUE TO SERVE AS RAW MATERIAL TO OPTIMIZE COMPUTER MODELS FOR METEOROLOGICAL PREDICTION. IT WAS HOPE THAT DETERMINATION COULD BE MADE OF THE TIME LIMITATION FOR SHORT-TERM MODELING. THIS SPACECRAFT IS ROUGHLY CYLINDRICAL WITH A HEIGHT OF 345 CM AND DIAMETER OF 216 CM. THE CYLINDRICAL SURFACE IS COVERED WITH SOLAR CELLS WHICH WILL PROVIDE 225 W. THE SATELLITE WILL BE SPIN-STABILIZED WITH A BESPIN EARTH-POINTING ANTENNA. THE SATELLITE IS POSITIONED NEAR 140 DEG E AND DESIGNED TO OPERATE FOR 5 YEARS. THIS IS A FOLLOW-ON GMS TYPE SPACECRAFT TO BE LAUNCHED AND CONTROLLED BY NASDA OF JAPAN.

\*\*\*\*\* GMS-2, JMA STAFF \*\*\*\*\*

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- GMS-2 -01 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - JMA STAFF

JAPANESE METEORO AGCY

BRIEF DESCRIPTION

THE VISIBLE IR SPIN-SCAN RADIOPETER (VISSR) IS SIMILAR TO VISSR EXPERIMENTS ON OTHER GARP (GLOBAL ATMOSPHERIC RESEARCH PROGRAM) SATELLITES SUCH AS GOES 1 AND GMS. IT WILL MAKE BOTH NIGHT (IR 10.5 TO 12.5 MICRORAMETERS) AND DAY IR, PLUS VISIBLE (.5 TO .75 MICRORAMETERS) PHOTOELECTRIC OBSERVATIONS OF THE SUBSATELLITE AREA AT 30 MIN INTERVALS. THE VISIBLE CHANNEL HAD A RESOLUTION OF ABOUT 3.25 KM AND THE IR CHANNEL HAD A RESOLUTION OF ABOUT 5 KM AT NADIR. REAL-TIME TRANSMISSION IS AVAILABLE TO THE DATA ACQUISITION STATION IN JAPAN, WITH ADDITIONAL DATA TRANSMISSION TO OTHER METEOROLOGICAL USERS AS NEEDED.

\*\*\*\*\* GMS-2, JMA STAFF \*\*\*\*\*

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- GMS-2 -03 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
COMMUNICATIONS

PERSONNEL

PI - JMA STAFF

JAPANESE METEORO AGCY

BRIEF DESCRIPTION

THE GMS-2 INCLUDES A COMMUNICATIONS FACILITY. THE OBJECTIVES OF THIS EQUIPMENT ARE (1) TO COLLECT AND RELAY WEATHER OBSERVATIONS FROM REMOTE STATIONS, INCLUDING BOOVS, SHIPS, AND UNMANNED STATIONS, AND (2) TO TRANSMIT WEATHER INFORMATION AND ANALYSES FROM THE CENTRAL WEATHER FACILITY TO OTHER WEATHER STATIONS.

\*\*\*\*\* GMS-2, KOHNO \*\*\*\*\*

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- GMS-2 -02 INVESTIGATIVE PROGRAM  
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - T. KOHNO

METEORO RES INST

BRIEF DESCRIPTION

THE SPACE ENVIRONMENT MONITOR (SEM) EXPERIMENT OBSERVES THE IN SITU CHARGED PARTICLE ENVIRONMENT. SOLAR PROTONS (1 TO 500 MEV), ALPHA PARTICLES (8 TO 390 MEV) AND SOLAR ELECTRONS (GREATER THAN 2 MEV) ARE DISCRIMINATED, AND THEIR RESPECTIVE ENERGIES MONITORED BY MEANS OF A NUMBER OF SOLID-STATE DETECTORS.

\*\*\*\*\* GOES-D \*\*\*\*\*

SPACECRAFT COMMON NAME- GOES-D

ALTERNATE NAMES-

NSSDC ID- GOES-D

LAUNCH DATE- 09/09/80 WEIGHT- 660. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE-SSUS

SPONSORING COUNTRY/AGENCY

UNITED STATES NOAA-NES

UNITED STATES NASA-OSTA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN INCLINATION- 1. DEG  
PERIAPSIS- 35786. KM ALT APOAPSIS- 35786. KM ALT

PERSONNEL

MG - A.J. CERVENKA  
PM - R.H. PICKARD

PS - M.E. SHEWK

NASA HEADQUARTERS  
NASA-GSFC

NASA-GSFC

BRIEF DESCRIPTION

GOES-D IS THE FOURTH IN A SERIES OF NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIES (1) A VISSR (VISIBLE INFRARED SPIN SCAN RADIOMETER) ATMOSPHERIC SOUNDER (VAS) TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA, TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, AND TO DETERMINE ATMOSPHERIC TEMPERATURE AND WATER CONTENT AT VARIOUS LEVELS, (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL AUTOMATIC PICTURE TRANSMISSION (APT)-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS, AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PROTON, ELECTRON, AND SOLAR X-RAY FLUXES AND MAGNETIC FIELDS. THE CYLINDRICALLY SHAPED SPACECRAFT MEASURES 190.5 CM IN DIAM AND 230 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDS AN ADDITIONAL 83 CM BEYOND THE CYLINDRICAL SHELL. THE PRIMARY STRUCTURAL MEMBERS ARE A HONEYCOMB EQUIPMENT SHELF AND THRUST TUBE. THE VISSR TELESCOPE IS MOUNTED ON THE EQUIPMENT SHELF AND VIEWS THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDS RADIALLY FROM THE THRUST TUBE AND IS AFFIXED TO THE SOLAR PANELS, WHICH FORMS THE OUTER WALLS OF THE SPACECRAFT TO PROVIDE THE PRIMARY SOURCE OF ELECTRICAL POWER, LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS ARE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) ARE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USES BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDES TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVES AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAS ATTAINED SYNCHRONOUS ORBIT.

\*\*\*\*\* GOES-D, NEST STAFF \*\*\*\*\*

INVESTIGATION NAME- VISIBLE-INFRARED SPIN SCAN RADIOMETER  
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-D -01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

## PERSONNEL

PI - NESS STAFF  
OI - W.E. SHENK

NOAA-NESS  
NASA-GSFC

## BRIEF DESCRIPTION

THE VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VISSR) OPERATES IN THREE DISTINCT MODES TO PROVIDE PARAMETER FLEXIBILITY, SPECTRAL BAND SELECTION, GEOGRAPHIC LOCATION, AND S/N RATIO. THE VISSR MODE IS THE SAME AS THE VISSR SYSTEM ON BOARD GOES 1, 2, & 3. BOTH THE IR CHANNEL (10.5 TO 12.5 MICRONEETERS) AND VISIBLE CHANNEL (0.55 TO 0.75 MICRONEETERS) USE COMMON OPTICS. INCOMING RADIATION IS COLLECTED BY A RICHETY-CHRETIAN OPTICAL SYSTEM. THE SPINNING MOTION OF THE SPACECRAFT (100 RPM) PROVIDES A WEST TO EAST (W TO E) SCAN MOTION. SCAN MISSION TILT AFTER EACH SPIN PROVIDES A NORTH TO SOUTH (N TO S) SCAN MOTION. A FULL PICTURE TAKES 18.2 MIN TO COMPLETE AND 2 MIN TO RESET FOR NEXT IMAGE. EIGHT VISIBLE-SPECTRUM DETECTORS (0.9 KM HORIZONTAL RESOLUTION) AND ONE MERCURY-CADMIUM TELLURIDE IR DETECTOR (6.9 HORIZONTAL RESOLUTION) SWEEP THE EARTH DURING EACH SCAN. THE DWELL-SOUNDING MODE USES UP TO 12 SPECTRAL FILTERS IN A WHEEL COVERING THE RANGE 678.7 PER CM (14.76 MICRONEETERS) THROUGH 2535 PER CM (3.94 MICRONEETERS) POSITIONED INTO THE OPTICAL TRAIN WHILE THE SCANNER IS DWELLING ON A SINGLE N TO S SCAN LINE. THE FILTER WHEEL CAN BE PROGRAMMED SO THAT EACH SPECTRAL BAND FILTER CAN DWELL ON A SINGLE SCAN LINE FOR FROM 0 TO 255 SPACECRAFT SPINS. EITHER THE 6.9-KM OR 13.8-KM RESOLUTION DETECTORS CAN BE SELECTED FOR THE SEVEN FILTER POSITIONS OPERATING IN THE SPECTRAL REGION 701.6 PER CM (14.25 MICRONEETERS) THROUGH 1487 PER CM (6.725 MICRONEETERS). FOR THE REMAINING FIVE SPECTRAL BANDS THE 13.8-KM RESOLUTION DETECTORS ARE USED. SELECTABLE FRAME SIZE, POSITION AND SCAN DIRECTION ARE ALSO PROGRAMMABLE VIA GROUND COMMAND. FOR THE VISSR DEMONSTRATION, 10-BIT REDUCED RESOLUTION (3.5 KM) VISIBLE DATA ARE PROVIDED FOR IMAGING. IN SOME OF THE SPECTRAL REGIONS, MULTIPLE-LINE DATA ARE REQUIRED TO ENHANCE THE SIGNAL-TO-NOISE (S/N) RATIO. TYPICALLY, 167 SPACECRAFT SPINS AT THE SAME N TO S SCAN LINE POSITION ARE REQUIRED TO OBTAIN THE DESIRED SOUNDING DATA. THIS NUMBER OF SPINS PER LINE SHOULD BE ADEQUATE TO OBTAIN SOUNDINGS HAVING A 30- X 30-KM RESOLUTION AND REQUIRE APPROXIMATELY 1.9 MINUTES ON THE AVERAGE. THE MULTISPECTRAL IMAGING (MSI) MODE CAN PROVIDE NORMAL VISSR IN IMAGING PLUS DATA IN ANY TWO SELECTED SPECTRAL BANDS HAVING A SPATIAL RESOLUTION OF 13.8 KM. THIS MODE OF OPERATION TAKES ADVANTAGE OF THE SMALL MERCURY-CADMIUM TELLURIDE DETECTOR OFFSET IN THE N TO S PLANE. USING THE DATA FROM THESE DETECTORS SIMULTANEOUSLY PRODUCES A COMPLETE INFRARED MAP WHEN THEY ARE OPERATED EVERY OTHER SCAN LINE. THIS ALLOWS USING THE LARGER DETECTORS DURING HALF OF THE IMAGING/SCANNING SEQUENCE PERIOD TO OBTAIN ADDITIONAL SPECTRAL INFORMATION. UNLIMITED N TO S FRAME SIZE AND POSITION SELECTION, WITHIN THE MAXIMUM N TO S FOV SCAN DIRECTION, CAN BE SELECTED. VISIBLE DATA ARE NOT AVAILABLE IN THIS MODE SINCE THE VISSR IS CONSTRAINED TO THE LDR SYSTEM. THE VISSR OUTPUT IS DIGITIZED AND TRANSMITTED TO THE NOAA COMMAND DATA ACQUISITION STATION, WALLOPS ISLAND, VA. THERE THE SIGNAL IS FED INTO A 'LINE STRETCHER,' WHERE IT IS STORED AND TIME-STRETCHED FOR TRANSMISSION BACK TO THE SATELLITE AT REDUCED BANDWIDTH FOR REBROADCAST TO APT USER STATIONS. AS WITH ALL OPERATIONAL-TYPE DATA, THE VISSR DATA ARE HANDLED BY NOAA AND EVENTUALLY SENT TO THE NATIONAL CLIMATIC CENTER AT ASHEVILLE, NORTH CAROLINA, FOR ARCHIVING. SINCE WALLOPS ISLAND IS COMMITTED TO NOAA OPERATIONAL SUPPORT DATA FROM THE VISSR MSI MODE AND THE DWELL SOUNDING MODE WILL NOT BE 'STRETCHED'.

----- GOES-D, NESS STAFF -----

INVESTIGATION NAME- METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM

NSSDC ID- GOES-D -05

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

## PERSONNEL

PI - NESS STAFF

NOAA-NESS

## BRIEF DESCRIPTION

THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM IS AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM DESIGNED TO RECEIVE AND PROCESS METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (OBSERVATION) PLATFORMS (DCP). THE COLLECTED DATA ARE RETRANSMITTED FROM THE SATELLITE TO SMALL, GROUND-BASED, REGIONAL DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS CAN BE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWS FOR THE RETRANSMISSION OF NARROW-BAND (WEFAX TYPE) DATA FROM CENTRALIZED WEATHER FACILITIES TO EXISTING SMALL, GROUND-BASED APT RECEIVING STATIONS. THIS COMMUNICATIONS SYSTEM OPERATES ON S-BAND FREQUENCIES. THE MINIMUM DATA COLLECTION SYSTEM FOR ONE SMALL METEOROLOGICAL SATELLITE CONSISTS OF APPROXIMATELY 3500 DCP STATIONS TO BE CONTACTED IN A 6-H PERIOD. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6-H PERIOD IS BETWEEN 3500 AND 6000 BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARY FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT AN INDIVIDUAL DCP STATION.

----- GOES-D, WILLIAMS -----

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-D -02

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

## PERSONNEL

PI - D.J. WILLIAMS  
OI - H.H. SAUER

NOAA-ERL  
NOAA-ERL

## BRIEF DESCRIPTION

THE ENERGETIC PARTICLE MONITOR CONSISTS OF THREE DETECTOR ASSEMBLIES, EACH COVERING LIMITED REGIONS OF THE OVERALL ENERGY SPECTRUM. THE FIRST TWO DETECTOR ASSEMBLIES MONITOR PROTONS IN SEVEN ENERGY RANGES BETWEEN 0.8 AND 500 MEV, AND ALPHA PARTICLES IN SIX RANGES BETWEEN 0 AND .GT. 400 REV. THERE IS ALSO ONE CHANNEL FOR THE MEASUREMENT OF ELECTRONS IN THE RANGE .GE. 500 KEV.

----- GOES-D, WILLIAMS -----

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-D -03

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

## PERSONNEL

PI - D.J. WILLIAMS  
OI - R.F. DONNELLY

NOAA-ERL  
NOAA-ERL

## BRIEF DESCRIPTION

THE X-RAY MONITOR CONSISTS OF ION CHAMBER DETECTORS. THE RANGES AND MINIMUM USEFUL THRESHOLD SENSITIVITY ARE 0.5 TO 3A, 1.0E-13 J PER CM PER S AND 1 TO 8A, 1.0E-12 J PER CM PER S WITH A DYNAMIC RANGE OF 1.E4.

----- GOES-D, WILLIAMS -----

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-D -04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

## PERSONNEL

PI - D.J. WILLIAMS  
OI - J.N. BARFIELD

NOAA-ERL  
SOUTHWEST RES INST

## BRIEF DESCRIPTION

THE MAGNETOMETER HAS A RANGE OF PLUS OR MINUS 400 NT (WITHOUT SATURATION) AND A RESOLUTION OF 0.1 NT OVER A RANGE OF PLUS OR MINUS 50 NT.

\*\*\*\*\* GOES-E \*\*\*\*\*

SPACECRAFT COMMON NAME- GOES-E  
ALTERNATE NAMES-

NSSDC ID- GOES-E

LAUNCH DATE- 03/12/81  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
WEIGHT- 660. KG  
LAUNCH VEHICLE- SHLLE-SSUS

SPONSORING COUNTRY/AGENCY  
UNITED STATES  
UNITED STATES

NOAA-NESS  
NASA-OSTA

## PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN  
PERIAPSIS- 35786. KM ALT  
INCLINATION- 1. DEG  
APOAPSIS- 35786. KM ALT

## PERSONNEL

MG - A.J. CERVENKA  
PM - R.H. PICKARD  
PS - W.E. SHENK

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

## BRIEF DESCRIPTION

GOES-E IS THE FIFTH IN A SERIES OF NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIES (1) A VISIBLE INFRARED SPIN SCAN RADIOMETER (VISSR) ATMOSPHERIC SOUNDER (VISSR) TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA, TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, AND TO DETERMINE ATMOSPHERIC TEMPERATURE AND WATER CONTENT AT VARIOUS LEVELS; (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL AUTOMATIC PICTURE TRANSMISSION (APT)-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS; AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PROTON, ELECTRON, AND SOLAR

X-RAY FLUENES AND MAGNETIC FIELDS. THE CYLINDRICALLY SHAPED SPACECRAFT MEASURES 198.5 CM IN DIAM AND 230 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDS AN ADDITIONAL 83 CM BEYOND THE CYLINDRICAL SHELL. THE PRIMARY STRUCTURAL MEMBERS ARE A HONEYCOMBED EQUIPMENT SHELF AND THRUST TUBE. THE VISSR TELESCOPE IS MOUNTED ON THE EQUIPMENT SHELF AND VIEWS THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDS RADIALLY FROM THE THRUST TUBE AND IS AFFIRED TO THE SOLAR PANELS, WHICH FORMS THE OUTER WALLS OF THE SPACECRAFT TO PROVIDE THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS ARE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) ARE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USES BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDES TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVES AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAS ATTAINED SYNCHRONOUS ORBIT.

----- GOES-E, NESS STAFF -----

INVESTIGATION NAME- VISIBLE-INFRARED SPIN SCAN RADIOMETER  
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-E -01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF  
OI - W.E. SHENK

NOAA-NESS  
NASA-GSFC

BRIEF DESCRIPTION

THE VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS) OPERATES IN THREE DISTINCT MODES TO PROVIDE PARAMETER FLEXIBILITY, SPECTRAL BAND SELECTION, GEOGRAPHIC LOCATION, AND SIGNAL-TO-NOISE (S/N) RATIO. THE VISSR MODE IS THE SAME AS THE VISSR SYSTEM ON BOARD GOES 1, 2, 3. BOTH THE IR CHANNEL (10.5 TO 12.5 MICROMETERS) AND VISIBLE CHANNEL (0.55 TO 0.75 MICROMETERS) USE COMMON OPTICS. INCOMING RADIATION IS COLLECTED BY A RICHHEY-CRETZIER OPTICAL SYSTEM. THE SPINNING MOTION OF THE SPACECRAFT (100 RPM) PROVIDES A WEST TO EAST (N TO E) SCAN MOTION. SCAN MISSION TILT AFTER EACH SPIN PROVIDES A NORTH TO SOUTH (N TO S) SCAN MOTION. A FULL PICTURE TAKES 18.2 MIN TO COMPLETE AND 2 MIN TO RESET FOR NEXT IMAGE. EIGHT VISIBLE-SPECTRUM DETECTORS (0.9 KM HORIZONTAL RESOLUTION) AND ONE MERCURY-CAIDIUM TELLURIDE IR DETECTOR (6.9 HORIZONTAL RESOLUTION) SWEEP THE EARTH DURING EACH SCAN. THE DWELL-SOUNDING MODE USES UP TO 12 SPECTRAL FILTERS IN A WHEEL COVERING THE RANGE 678.7 PER CM (14.75 MICROMETERS) THROUGH 2555 PER CM (3.94 MICROMETERS) POSITIONED INTO THE OPTICAL TRAIN WHILE THE SCANNER IS DWELLING ON A SINGLE N TO S SCAN LINE. THE FILTER WHEEL CAN BE PROGRAMMED SO THAT EACH SPECTRAL BAND FILTER CAN DWELL ON A SINGLE SCAN LINE FOR FROM 0 TO 255 SPACECRAFT SPINS. EITHER THE 6.9-KM OR 13.8-KM RESOLUTION DETECTORS CAN BE SELECTED FOR THE SEVEN FILTER POSITIONS OPERATING IN THE SPECTRAL REGION 701.6 PER CM (14.25 MICROMETERS) THROUGH 1487 PER CM (6.725 MICROMETERS). FOR THE REMAINING FIVE SPECTRAL BANDS THE 13.8-KM RESOLUTION DETECTORS ARE USED. SELECTABLE FRAME SIZE, POSITION AND SCAN DIRECTION ARE ALSO PROGRAMMABLE VIA GROUND COMMAND. FOR THE VAS DEMONSTRATION, 10-BIT REDUCED RESOLUTION (3.5 KM) VISIBLE DATA IS PROVIDED FOR IMAGING. IN SOME OF THE SPECTRAL REGIONS, MULTIPLE-LINE DATA ARE REQUIRED TO ENHANCE THE SIGNAL-TO-NOISE (S/N) RATIO. TYPICALLY, 167 SATELLITE SPINS AT THE SAME N TO S SCAN LINE POSITION ARE REQUIRED TO OBTAIN THE DESIRED SOUNDING DATA. THIS NUMBER OF SPINS PER LINE SHOULD BE ADEQUATE TO OBTAIN SOUNDINGS HAVING A 30 X 30-KM RESOLUTION AND REQUIRE APPROXIMATELY 1.9 MINUTES ON THE AVERAGE. THE MULTISPECTRAL IMAGING (MSI) MODE CAN PROVIDE NORMAL VISSR IR IMAGING PLUS DATA IN ANY TWO SELECTED SPECTRAL BANDS HAVING A SPATIAL RESOLUTION OF 13.8 KM. THIS MODE OF OPERATION TAKES ADVANTAGE OF THE SMALL MERCURY-CAIDIUM TELLURIDE DETECTOR OFFSET IN THE N TO S PLANE, USING THE DATA FROM THESE DETECTORS SIMULTANEOUSLY PRODUCES A COMPLETE INFRARED MAP WHEN THEY ARE OPERATED EVERY OTHER SCAN LINE. THIS ALLOWS USING THE LARGER DETECTORS DURING HALF OF THE IMAGING/SCANNING SEQUENCE PERIOD TO OBTAIN ADDITIONAL SPECTRAL INFORMATION. UNLIMITED N TO S FRAME SIZE AND POSITION SELECTION, WITHIN THE MAXIMUM N TO S FOV SCAN DIRECTION, CAN BE SELECTED. VISIBLE DATA ARE NOT AVAILABLE IN THIS MODE SINCE THE VAS IS CONSTRAINED TO THE LDR SYSTEM. THE VISSR OUTPUT IS DIGITIZED AND TRANSMITTED TO THE NOAA COMMAND DATA ACQUISITION STATION, WALLOPS ISLAND, VA. THERE THE SIGNAL IS FED INTO A 'LINE STRETCHER,' WHERE IT IS STORED AND TIME-STRETCHED FOR TRANSMISSION BACK TO THE SATELLITE AT REDUCED BANDWIDTH FOR REBROADCAST TO APT USER STATIONS. AS WITH ALL OPERATIONAL-TYPE DATA, THE VISSR DATA ARE HANDLED BY NOAA AND EVENTUALLY SENT TO THE NATIONAL CLIMATIC CENTER AT ASHEVILLE, NORTH CAROLINA, FOR ARCHIVING. SINCE WALLOPS ISLAND IS COMMITTED TO NOAA OPERATIONAL SUPPORT DATA FROM THE VAS MSI MODE AND THE DWELL SOUNDING MODE WILL NOT BE 'STRETCHED'.

----- GOES-E, NESS STAFF -----

INVESTIGATION NAME- METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM

NSSDC ID- GOES-E -02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM IS AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM DESIGNED TO RECEIVE AND PROCESS METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (OBSERVATION) PLATFORMS (DCP). THE COLLECTED DATA ARE RETRANSMITTED FROM THE SATELLITE TO SMALL, GROUND-BASED, REGIONAL DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS CAN BE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWS FOR THE RETRANSMISSION OF NARROW-BAND (FAX TYPE) DATA FROM CENTRALIZED WEATHER FACILITIES TO EXISTING SMALL, GROUND-BASED APT RECEIVING STATIONS. THIS COMMUNICATIONS SYSTEM OPERATES ON S-BAND FREQUENCIES. THE MINIMUM DATA COLLECTION SYSTEM FOR ONE SMALL METEOROLOGICAL SATELLITE CONSISTS OF APPROXIMATELY 3500 DCP STATIONS TO BE CONTACTED IN A 6-H PERIOD. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6-H PERIOD IS BETWEEN 350K AND 600K BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARY FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT AN INDIVIDUAL DCP STATION.

----- GOES-E, WILLIAMS -----

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-E -03

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
OI - M.H. SAUER

NOAA-ERL  
NOAA-ERL

BRIEF DESCRIPTION

THE ENERGETIC PARTICLE MONITOR CONSISTS OF THREE DETECTOR ASSEMBLIES, EACH COVERING LIMITED REGIONS OF THE OVERALL ENERGY SPECTRUM. THE FIRST TWO DETECTOR ASSEMBLIES MONITOR PROTONS IN SEVEN ENERGY RANGES BETWEEN 0.8 AND 500 MEV AND ALPHA PARTICLES IN SIX RANGES BETWEEN 4 AND .GT. 400 MEV. THERE IS ALSO ONE CHANNEL FOR THE MEASUREMENT OF ELECTRONS IN THE .GE. 500 KEV RANGE.

----- GOES-E, WILLIAMS -----

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-E -03

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - D.J. WILLIAMS  
OI - R.F. DONNELLY

NOAA-ERL  
NOAA-ERL

BRIEF DESCRIPTION

THE X-RAY MONITOR CONSISTS OF ION CHAMBER DETECTORS. THE RANGES AND MINIMUM USEFUL THRESHOLD SENSITIVITY ARE 0.5 TO 3A, 1.0E-13 J PER SQ CM PER S AND 1 TO 8A, 1.0E-12 J PER SQ CM PER S WITH A DYNAMIC RANGE OF 1.0E4.

----- GOES-E, WILLIAMS -----

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-E -04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
OI - J.N. BARFIELD

NOAA-ERL  
SOUTHWEST RES INST

BRIEF DESCRIPTION

THE MAGNETOMETER WILL HAVE A RANGE OF PLUS OR MINUS 400 NT (WITHOUT SATURATION) AND A RESOLUTION OF 0.1 NT OVER A RANGE OF PLUS OR MINUS 50 NT.

\*\*\*\*\* GOES-F \*\*\*\*\*

SPACECRAFT COMMON NAME= GOES-F  
ALTERNATE NAMES=

NSSDC ID= GOES-F

LAUNCH DATE= 09/16/82 WEIGHT= 660. KG  
LAUNCH SITE= CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE= SHLLE-SBS

SPONSORING COUNTRY/AGENCY  
UNITED STATES NOAA-NESS  
UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS  
ORBIT TYPE= GEOCENTRIC INCLINATION= 1. DEG  
ORBIT PERIOD= 1490. MIN APOAPSIS= 35786. KM ALT  
PERIAPSIS= 35786. KM ALT

PERSONNEL  
MG - A.J. CERVENKA NASA HEADQUARTERS  
PM - R.H. PICKARD NASA-GSFC  
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

GOES-F IS THE SIXTH IN A SERIES OF NASA-DEVELOPED, NOAA-OPERATED SPACECRAFT. THE SPIN-STABILIZED, EARTH-SYNCHRONOUS SPACECRAFT CARRIES (1) A VISIBLE INFRARED SPIN SCAN RADIOMETER (VISSR) ATMOSPHERIC SOUNDER (VAS) TO PROVIDE HIGH-QUALITY DAY/NIGHT CLOUDCOVER DATA, TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, AND TO DETERMINE ATMOSPHERIC TEMPERATURE AND WATER CONTENT AT VARIOUS LEVELS, (2) A METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM TO RELAY PROCESSED DATA FROM CENTRAL WEATHER FACILITIES TO SMALL AUTOMATIC PICTURE TRANSMISSION (APT)-EQUIPPED REGIONAL STATIONS AND TO COLLECT AND RETRANSMIT DATA FROM REMOTELY LOCATED EARTH-BASED PLATFORMS, AND (3) A SPACE ENVIRONMENT MONITOR (SEM) SYSTEM TO MEASURE PROTON, ELECTRON, AND SOLAR X-RAY FLUXES AND MAGNETIC FIELDS. THE CYLINDRICALLY SHAPED SPACECRAFT MEASURES 190.5 CM IN DIAM AND 250 CM IN LENGTH, EXCLUSIVE OF A MAGNETOMETER THAT EXTENDS AN ADDITIONAL 83 CM BEYOND THE CYLINDRICAL SHELL. THE PRIMARY STRUCTURAL MEMBERS ARE A HONEYCOMBED EQUIPMENT SHELF AND THRUST TUBE. THE VISSR TELESCOPE IS MOUNTED ON THE EQUIPMENT SHELF AND VIEWS THE EARTH THROUGH SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDS RADIALLY FROM THE THRUST TUBE AND IS AFFIXED TO THE SOLAR PANELS, WHICH FORMS THE OUTER WALL OF THE SPACECRAFT TO PROVIDE THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE THRUST TUBE AND THE SOLAR PANELS ARE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT, BATTERIES, AND MOST OF THE SEM EQUIPMENT. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) ARE MAINTAINED BY TWO SEPARATE SETS OF JET THRUSTERS MOUNTED AROUND THE SPACECRAFT'S EQUATOR AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USES BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEM. A LOW-POWER VHF TRANSPONDER PROVIDES TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVES AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAS ATTAINED SYNCHRONOUS ORBIT.

----- GOES-F, NESS STAFF -----

INVESTIGATION NAME= VISIBLE-INFRARED SPIN SCAN RADIOMETER  
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID= GOES-F -01 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF NOAA-NESS  
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

THE VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS) OPERATES IN THREE DISTINCT MODES TO PROVIDE PARAMETER FLEXIBILITY, SPECTRAL BAND SELECTION, GEOGRAPHIC LOCATION, AND SIGNAL TO NOISE RATIO. THE VISSR MODE IS THE SAME AS THE VISSR SYSTEM ON BOARD GOES 1, 2, 3, BOTH THE IR CHANNEL (10.5 TO 12.5 MICRUMETERS) AND VISIBLE CHANNEL (0.55 TO 0.75 MICRUMETERS) USE COMMON OPTICS. INCOMING RADIATION IS COLLECTED BY A RICHETY-CHRETIAN OPTICAL SYSTEM. THE SPINNING MOTION OF THE SPACECRAFT (100 RPM) PROVIDES A WEST TO EAST (N TO E) SCAN MOTION. SCAN MISSION TILT AFTER EACH SPIN PROVIDES A NORTH TO SOUTH (N TO S) SCAN MOTION. A FULL PICTURE TAKES 18.2 MIN TO COMPLETE AND 2 MIN TO RESET FOR NEXT IMAGE. EIGHT VISIBLE-SPECTRUM DETECTORS (0.9 KM HORIZONTAL RESOLUTION) AND ONE MERCURY-CADMIUM TELLURIDE IR DETECTOR (6.9 KM HORIZONTAL RESOLUTION) SWEEP THE EARTH DURING EACH SCAN. THE DWELL-SOUNDING MODE USES UP TO 12 SPECTRAL FILTERS IN A WHEEL COVERING THE RANGE 678.7 PER CM (14.74 MICRUMETERS) THROUGH 2355 PER CM (3.94 MICRUMETERS) POSITIONED INTO THE OPTICAL TRAIN WHILE THE SCANNER IS DWELLING ON A SINGLE N TO S SCAN LINE. THE FILTER WHEEL CAN BE PROGRAMMED SO THAT EACH SPECTRAL BAND FILTER CAN DWELL ON A SINGLE SCAN LINE FOR FROM 0 TO 255 SPACECRAFT SPINS. EITHER THE 6.9-KM OR 13.8-KM RESOLUTION DETECTORS CAN BE SELECTED FOR THE SEVEN FILTER POSITIONS OPERATING IN THE SPECTRAL REGION 701.6 PER CM (14.25 MICRUMETERS) THROUGH 1687 PER CM (6.725 MICRUMETERS). FOR THE REMAINING FIVE SPECTRAL BANDS THE 13.8-KM RESOLUTION DETECTORS

ARE USED. SELECTABLE FRAME SIZE, POSITION AND SCAN DIRECTION ARE ALSO PROGRAMMABLE VIA GROUND COMMAND. FOR THE VAS DEMONSTRATION, 10-BIT REDUCED RESOLUTION (3.5KM) VISIBLE DATA IS PROVIDED FOR IMAGING. IN SOME OF THE SPECTRAL REGIONS, MULTIPLE-LINE DATA ARE REQUIRED TO ENHANCE THE SIGNAL-TO-NOISE (S/N) RATIO. TYPICALLY, 167 SATELLITE SPINS AT THE SAME N TO S SCAN LINE POSITION ARE REQUIRED TO OBTAIN THE DESIRED SOUNDING DATA. THIS NUMBER OF SPINS PER LINE SHOULD BE ADEQUATE TO OBTAIN SOUNDINGS HAVING A 30 X 30-KM RESOLUTION AND REQUIRE APPROXIMATELY 1.9 MINUTES ON THE AVERAGE. THE MULTISPECTRAL IMAGING (MSI) MODE CAN PROVIDE NORMAL VISSR IR IMAGING PLUS DATA IN ANY TWO SELECTED SPECTRAL BANDS HAVING A SPATIAL RESOLUTION OF 13.8 KM. THIS MODE OF OPERATION TAKES ADVANTAGE OF THE SMALL MERCURY-CADMIUM TELLURIDE DETECTOR OFFSET IN THE N TO S PLANE. USING THE DATA FROM THESE DETECTORS SIMULTANEOUSLY PRODUCES A COMPLETE INFRARED MAP WHEN THEY ARE OPERATED EVERY OTHER SCAN LINE. THIS ALLOWS USING THE LARGER DETECTORS DURING HALF OF THE IMAGING/SCANNING SEQUENCE PERIOD TO OBTAIN ADDITIONAL SPECTRAL INFORMATION. UNLIMITED N TO S FRAME SIZE AND POSITION SELECTIONS, WITHIN THE MAXIMUM N TO S FOV SCAN DIRECTION, CAN BE SELECTED. VISIBLE DATA ARE NOT AVAILABLE IN THIS MODE SINCE THE VAS IS CONSTRAINED TO THE LDR SYSTEM. THE VISSR OUTPUT IS DIGITIZED AND TRANSMITTED TO THE NOAA COMMAND DATA ACQUISITION STATION, WALLOPS ISLAND, VA. THERE THE SIGNAL IS FED INTO A "LINE STRETCHER," WHERE IT IS STORED AND TIME-STRETCHED FOR TRANSMISSION BACK TO THE SATELLITE AT REDUCED BANDWIDTH FOR REBROADCAST TO APT USER STATIONS. AS WITH ALL OPERATIONAL-TYPE DATA, THE VISSR DATA ARE HANDLED BY NOAA AND EVENTUALLY SENT TO THE NATIONAL CLIMATIC CENTER AT ASHEVILLE, NORTH CAROLINA, FOR ARCHIVING. SINCE WALLOPS ISLAND IS COMMITTED TO NOAA OPERATIONAL SUPPORT DATA FROM THE VAS MSI MODE AND THE DWELL SOUNDING MODE WILL NOT BE "STRETCHED".

----- GOES-F, NESS STAFF -----

INVESTIGATION NAME= METEOROLOGICAL DATA COLLECTION AND  
TRANSMISSIONS SYSTEM

NSSDC ID= GOES-F -02 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION  
THE METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM IS AN EXPERIMENTAL COMMUNICATIONS AND DATA HANDLING SYSTEM DESIGNED TO RECEIVE AND PROCESS METEOROLOGICAL DATA COLLECTED FROM REMOTELY LOCATED EARTH-BASED DATA COLLECTION (COLLECTION) PLATFORMS (DCP). THE COLLECTED DATA ARE RETRANSMITTED FROM THE SATELLITE TO SMALL, GROUND-BASED, REGIONAL DATA UTILIZATION CENTERS. DATA FROM UP TO 10,000 DCP STATIONS CAN BE HANDLED BY THE SYSTEM. THE SYSTEM ALSO ALLOWS FOR THE RETRANSMISSION OF NARROW-BAND (WEFAX TYPE) DATA FROM CENTRALIZED WEATHER FACILITIES TO SMALL GROUND-BASED APT RECEIVING STATIONS. THIS COMMUNICATIONS SYSTEM OPERATES ON S-BAND FREQUENCIES. THE MINIMUM DATA COLLECTION SYSTEM FOR ONE SMALL METEOROLOGICAL SATELLITE CONSISTS OF APPROXIMATELY 3500 DCP STATIONS TO BE CONTACTED IN A 6-H PERIOD. THE TOTAL AMOUNT OF DATA COLLECTED DURING THE 6-H PERIOD IS BETWEEN 350K AND 600K BITS, DEPENDING ON THE CODING TECHNIQUES. DATA RECEIVED FROM INDIVIDUAL STATIONS VARY FROM 50 TO 3000 BITS, DEPENDING ON THE TYPE AND VARIETY OF SENSORS USED AT AN INDIVIDUAL DCP STATION.

----- GOES-F, WILLIAMS -----

INVESTIGATION NAME= ENERGETIC PARTICLE MONITOR

NSSDC ID= GOES-F -03 INVESTIGATIVE PROGRAM  
CODE EB/OPEN ENVIRON MONITORING  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - D.J. WILLIAMS NOAA-ERL  
OI - H.M. SAUER NOAA-ERL

BRIEF DESCRIPTION

THE ENERGETIC PARTICLE MONITOR CONSISTS OF THREE DETECTOR ASSEMBLIES, EACH COVERING LIMITED REGIONS OF THE OVERALL ENERGY SPECTRUM. THE FIRST TWO DETECTOR ASSEMBLIES MONITOR PROTONS IN SEVEN ENERGY RANGES BETWEEN 0.8 AND 500 MEV, AND ALPHA PARTICLES IN SIX RANGES BETWEEN 4 AND .GT. 400 MEV. THERE IS ALSO ONE CHANNEL FOR THE MEASUREMENT OF ELECTRONS IN THE .GE. 500 KEV RANGE.

----- GOES-F, WILLIAMS -----

INVESTIGATION NAME= SOLAR X-RAY MONITOR

NSSDC ID= GOES-F -03 INVESTIGATIVE PROGRAM  
CODE EB/OPEN ENVIRON MONITORING  
INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS



SYSTEM WILL PROVIDE MEASUREMENTS OF AVERAGE SURFACE HEIGHT TO A 5- TO 10-CM ACCURACY. FOR THE CROSS-TRACK RANGING FUNCTIONS, A TWO-AXIS GIMBALED MIRROR POINTS THE BEAM OVER A WIDE FOV. POINTING ACCURACY OF BETTER THAN SIX ARC-SECONDS IS ACHIEVABLE USING 20-BIT ENCODERS TOGETHER WITH A SENSITIVE INTEGRAL GYRO PACKAGE AND PERIODIC ON-ORBIT CALIBRATIONS.

----- ICEX, JONES, JR.-----

INVESTIGATION NAME- SCATTEROMETER (SCAT)

NSSDC ID- ICEX-A -03      INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - W.L. JONES, JR.  
PI - W.L. GRANTHAM

NASA-LARC  
NASA-LARC

BRIEF DESCRIPTION

THE ICEX SCATTEROMETER (SCAT) IS AN ACTIVE MICROWAVE INSTRUMENT FOR MEASURING THE NORMALIZED RADAR CROSS SECTION OF THE SURFACE IN THE POLAR REGIONS. THE BASIC SCATTEROMETER DESIGN IS AN UPGRADED VERSION OF THE SEASAT SCATTEROMETER. THE OPERATING FREQUENCY IS 14.6 GHZ. THE SCATTEROMETER GENERATES ACTIVE MEASUREMENTS THAT ARE COLOCATED WITH THE PASSIVE MEASUREMENTS OF THE LARGE ANTENNA MULTIFREQUENCY MICROWAVE RADIOMETER (LAMMR). THE DATA OBTAINED ALSO PROVIDE A LIBRARY OF THE NORMALIZED RADAR CROSS SECTION VERSUS INCIDENCE ANGLE FOR VARIOUS TYPES OF ICE SURFACE. THE SCATTEROMETERS ELECTRONICALLY-STEERABLE ANTENNAS WILL TOGETHER COVER A SWATH NEARLY 1500 KM WIDE, WITH RESOLUTION CELL SIZE OF 10 TO 25 KM. THE OVERLAPPING SWATH FROM SEQUENTIAL ORBITS WILL ENABLE MEASUREMENTS OF THE NORMALIZED RADAR CROSS SECTION OF THE SAME AREA AT UP TO FIVE DIFFERENT INCIDENCE ANGLES. THE BASIC SCATTEROMETER'S ANTENNAS ARE FIVE 3-M X 15-CM RODS, ORIENTED PARALLEL TO THE GROUND AT EITHER 90 OR 45 DEG TO THE SPACECRAFT VELOCITY VECTOR. THE PATTERN OF EACH ANTENNA IS AN ELECTRONICALLY STEERABLE NARROW FAN BEAM. RESOLUTION CELL SIZE IS UNDER SOFTWARE CONTROL. THE ANTENNA PATTERN PRODUCES A SWATH WIDTH OF 1400 KM, WHICH OVERLAPS BOTH THE LAMMR AND USIR SWATHS.

----- ICEX, KING-----

INVESTIGATION NAME- LARGE ANTENNA MULTIFREQUENCY MICROWAVE RADIOMETER (LAMMR)

NSSDC ID- ICEX-A -01      INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - J.L. KING

NASA-GSFC

BRIEF DESCRIPTION

THE LARGE ANTENNA MULTIFREQUENCY MICROWAVE RADIOMETER (LAMMR) PROVIDES DUAL-POLARIZATION RADIOMETRIC MEASUREMENTS IN SEVEN FREQUENCY BANDS BETWEEN 1.4 AND 91 GHZ OVER A SWATH 1600 KM WIDE. ITS GROUND INSTANTANEOUS FIELD-OF-VIEW (FOV) VARIES BETWEEN 7 AND 103 KM, DEPENDING ON FREQUENCY. THE SENSOR CONSISTS OF SEVEN CHANNELS FEEDING A COMMON 3- TO 6-M ANTENNA. THE ANTENNA AXIS IS POINTED 45 DEG AWAY FROM NADIR. THE LAMMR SCAN IS PRODUCED BY ROTATING THE ENTIRE ANTENNA ABOUT THE NADIR AXIS. AN OFFSET CASSEGRAIN PARABOLOIDAL REFLECTOR ANTENNA DESIGN WAS SELECTED BECAUSE OF ITS COMPACT CONFIGURATION AND ITS ABILITY TO FUNCTION OVER A WIDE FREQUENCY RANGE WITH HIGH GAIN EFFICIENCY AND LOW RF LOSSES. THE CASSEGRAIN FEED DESIGN PLACES THE FEEDHORN CLUSTER AND ELECTRONICS PACKAGE NEAR THE DRIVE MECHANISM. THIS TENDS TO ALLEVIATE THE PROBLEM OF DYNAMICALLY BALANCING THE ESTIMATED 150 KG STRUCTURE, WHICH ROTATED AT ONE REV/S. THE RADIOMETERS ARE OPERATED DURING A 120 DEG SEGMENT OF THE 360-DEG SCAN WHICH IS CENTERED ON THE SPACECRAFT VELOCITY VECTOR. CALIBRATION OCCURS ONCE PER SCAN DURING 30 DEG OF THE REMAINING 240 DEG. EACH RADIOMETER CHANNEL CONTAINS TWO RECEIVERS, ONE FOR EACH POLARIZATION. EXCEPT FOR THE 1.4 GHZ CHANNEL, THE RECEIVERS ARE OF THE TOTAL POWER TYPE, AND CALIBRATION IS ACCOMPLISHED BY SWITCHING THE INPUTS ALTERNATELY TO AN AMBIENT LOAD AND COLD SKY HORN DURING THE CALIBRATION INTERVAL. THE 1.4 GHZ CHANNEL USES A NULL BALANCED NOISE INJECTION SYSTEM FOR CALIBRATION TO MINIMIZE WEIGHT AND VOLUME. THE RECEIVERS BELOW 18 GHZ ARE A TUNED RADIO FREQUENCY USING FIELD-EFFECT TRANSISTOR AMPLIFIERS. THE RECEIVERS (>18 GHZ) USE BALANCED MIXERS FOLLOWED BY LOW-NOISE IF AMPLIFIERS. THIS APPROACH AND NEAR-STATE-OF-THE-ART DESIGN IS TO MEET THE EXTREME TEMPERATURE SENSITIVITY REQUIREMENTS (SIGNAL 1 DEG K) DEMANDED BY THE SHORT INTEGRATION TIMES ASSOCIATED WITH HIGH SURFACE RESOLUTION.

----- ICEX, KING-----

INVESTIGATION NAME- DATA COLLECTION AND LOCATION SYSTEM  
(DCLS)

NSSDC ID- ICEX-A -06

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - R.A. KING

NASA-GSFC

BRIEF DESCRIPTION

THE DATA COLLECTION AND LOCATION SYSTEM (DCLS) IS INCLUDED ON THE ICEX MISSION TO ACCOMMODATE ICE SCIENCE AND APPLICATION REQUIREMENTS FOR IN SITU SURFACE MEASUREMENTS. THE DCLS SATISFIES REQUIREMENTS FOR BOTH DATA TRANSFER AND POSITION LOCATION OF REMOTE, UNATTENDED PLATFORMS AND BALLOONS. IN ADDITION, THE SYSTEM IS USED TO PROVIDE AN ESTIMATE OF THE VELOCITY OF PLATFORMS AVERAGED OVER A PERIOD OF APPROXIMATELY 100 MINUTES. DCLS IS GENERALLY RELATED TO THE NIMBUS/RAMS AND TIROS-N/ARGOS SYSTEMS. DCLS IS COMPATIBLE WITH EXISTING ARGOS PLATFORMS PRESENTLY USING THE TIROS-N DATA COLLECTION SYSTEM.

\*\*\*\*\* INSAT-1A\*\*\*\*\*

SPACECRAFT COMMON NAME- INSAT-1A  
ALTERNATE NAMES- INDIAN NATIONAL SAT.

NSSDC ID- INSAT-1

LAUNCH DATE- 12/21/82      WEIGHT- KG  
LAUNCH SITE- SHRIHARIKOTA (ANDHRA PRADESH), INDIA  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
INDIA      ISRO

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN  
PERIAPSIS- 36000. KM ALT      INCLINATION- DEG  
APOAPSIS- 36000. KM ALT

PERSONNEL

PM - UNKNOWN

UNKNOWN

PS - UNKNOWN

UNKNOWN

BRIEF DESCRIPTION

THE INSAT-1 SATELLITE PROGRAM INCORPORATES TWO THREE-AXIS STABILIZED SPACECRAFT IN GEO-STATIONARY ORBIT (INSAT-1A AT 94 DEGREES E AND INSAT-1B AT 74 DEGREES E) WITH A HOST OF GROUND STATIONS THROUGHOUT INDIA. THE INSAT-1A SATELLITE, BUILT BY THE FORD AEROSPACE AND COMMUNICATIONS CORPORATION, PROVIDES A COMBINED TELECOMMUNICATIONS, DIRECT TV BROADCAST, AND METEOROLOGICAL SERVICE TO INDIA'S CIVILIAN COMMUNITY OVER A 7 YEAR IN-ORBIT LIFESPAN. THE TELECOMMUNICATIONS PACKAGE PROVIDES TWO-WAY LONG DISTANCE TELEPHONE CIRCUITS AND DIRECT RADIO AND TV BROADCASTING TO THE REMOTEST AREAS OF INDIA. THE METEOROLOGY PACKAGE IS COMPRISED OF A SCANNING VERY HIGH RESOLUTION TWO-CHANNEL RADIOMETER (VHRR) TO PROVIDE FULL FRAME, FULL EARTH COVERAGE EVERY 30 MINUTES. THE VISUAL CHANNEL (0.55-0.75 MICROMETERS) HAS A 2.75 KM RESOLUTION WHILE THE IR (10.5-12.5 MICROMETERS) CHANNEL HAS AN 11 KM RESOLUTION. USING THE INSAT-TV CAPABILITY, EARLY WARNINGS OF IMPENDING DISASTERS, I.E., FLOODS, STORMS, ETC., CAN DIRECTLY REACH THE CIVILIAN POPULATION IN REMOTE AREAS. THE INSAT-1A ALSO HAS A DATA CHANNEL FOR RELAYING METEOROLOGICAL, HYDROLOGICAL, AND OCEANOGRAPHIC DATA FROM UNATTENDED LAND-BASED OR OCEAN-BASED DATA COLLECTION AND TRANSMISSION PLATFORMS.

\*\*\*\*\* INSAT-1B\*\*\*\*\*

SPACECRAFT COMMON NAME- INSAT-1B  
ALTERNATE NAMES- INDIAN NATIONAL SAT.

NSSDC ID- INSAT1B

LAUNCH DATE- 1983      WEIGHT- KG  
LAUNCH SITE-  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
INDIA      ISRO

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN  
PERIAPSIS- 36000. KM ALT      INCLINATION- DEG  
APOAPSIS- 36000. KM ALT

PERSONNEL

BRIEF DESCRIPTION

THE INSAT-1 SATELLITE PROGRAM INCORPORATES TWO THREE-AXIS STABILIZED SPACECRAFT IN GEOSTATIONARY ORBIT (INSAT-1A AT 94 DEGREES E AND INSAT-1B AT 74 DEGREES E) WITH A HOST OF GROUND STATIONS THROUGHOUT INDIA. THE INSAT-1B SATELLITE, BUILT BY THE FORD AEROSPACE AND COMMUNICATIONS CORPORATION, PROVIDES A COMBINED TELECOMMUNICATIONS, DIRECT TV BROADCAST, AND METEOROLOGICAL SERVICE TO INDIA'S CIVILIAN COMMUNITY OVER A 7 YEAR IN-ORBIT LIFESPAN. THE TELECOMMUNICATIONS PACKAGE WILL PROVIDE TWO-WAY LONG-DISTANCE TELEPHONE CIRCUITS AND DIRECT RADIO AND TV BROADCASTING TO THE REMOTEST AREAS OF INDIA. THE METEOROLOGY PACKAGE IS COMPRISED OF A SCANNING VERY HIGH RESOLUTION TWO-CHANNEL RADIOMETER (VHRR) TO PROVIDE FULL FRAME, FULL EARTH COVERAGE EVERY 30 MINUTES. THE VISUAL CHANNEL

(0.55-0.75 MICRONS) HAS A 2.75 KM RESOLUTION WHILE THE IR (8.0-12.5 MICRONS) CHANNEL HAS AN 11 KM RESOLUTION. USING THE INBAS TV CAPABILITY, EARLY WARNINGS OF IMPENDING DISASTERS, I.E., FLOODS, STORMS, ETC., CAN DIRECTLY REACH THE CIVILIAN POPULATION EVEN IN REMOTE AREAS. THE INBAS-1D ALSO HAS A DATA CHANNEL FOR RELAYING METEOROLOGICAL, HYDROLOGICAL, AND GEONOGRAPHIC DATA FROM UNATTENDED LAND-BASED OR OCEAN-BASED DATA COLLECTION AND TRANSMISSION PLATFORMS.

\*\*\*\*\* IRM, HAERENDEL \*\*\*\*\*

INVESTIGATION NAME- LI AND BA RELEASE MODULE

NSSDC ID- IRP -01 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - G.	HAERENDEL	MPI-EXTRATELL PHYS
OI - H.	POPL	MPI-EXTRATELL PHYS
OI - B.	HAUBLER	MPI-EXTRATELL PHYS
OI - A.	VALENZUELA	MPI-EXTRATELL PHYS

BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTS OF SIX LI AND FOUR BA ION RELEASE CANNISTERS, CONTAINING A TOTAL OF 350 KG OF CHEMICALS. ONE LI RELEASE OF APPROXIMATELY 1,226 ATOMS, OCCURRING OUTSIDE THE MAGNETOSPHERE NEAR THE SUBSOLAR POINT, IS DETECTED INSIDE THE MAGNETOSPHERE BY INSTRUMENTS ON THE CCE SPACECRAFT. ADDITIONAL LI RELEASES, BA RELEASES, AND AN ARTIFICIAL COMET RELEASE WILL BE MADE AS THE ORBIT PRECESSES TO THE MAGNETOSPHERIC TAIL.

\*\*\*\*\* ISPM/ESA \*\*\*\*\*

SPACECRAFT COMMON NAME- ISPM/ESA

ALTERNATE NAMES- ISPM-B, ISP

INT SOLAR POLAR, SOLAR POLAR

NSSDC ID- ISPESA

LAUNCH DATE- 04/16/85 WEIGHT- 450. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC	INCLINATION- 70. DEG
ORBIT PERIOD- 2020. DAYS	APOAPSIS- 5.24 AU RAD
PERIAPSIS- 1.0 AU RAD	

PERSONNEL

PM - D.	EATON	ESA-ESTEC
PS - K.P.	MENZEL	ESA-ESTEC

BRIEF DESCRIPTION

THE PRIMARY OBJECTIVES OF THE INTERNATIONAL SOLAR POLAR MISSION (ISP) ARE FOR TWO SPACECRAFT TO INVESTIGATE, AS A FUNCTION OF SOLAR LATITUDE, THE PROPERTIES OF THE SOLAR CORONA, THE SOLAR WIND, THE STRUCTURE OF THE SUN-WIND INTERFACE, THE HELIOSPHERIC MAGNETIC FIELD, SOLAR AND NON-SOLAR COSMIC RAYS, SOLAR RADIO BURSTS AND PLASMA WAVES, AND THE INTERSTELLAR/INTERPLANETARY NEUTRAL GAS AND DUST. SECONDARY OBJECTIVES INCLUDE INTERPLANETARY PHYSICS INVESTIGATIONS DURING THE INITIAL EARTH-JUPITER PHASE, WHEN THE SEPARATION OF THE ESA AND THE NASA SPACECRAFT IS APPROXIMATELY 0.01 AU, AND MEASUREMENTS OF THE JOVIAN MAGNETOSPHERE DURING THE JUPITER FLYBY PHASE. THE TWO SPACECRAFT FOR THIS MISSION (ISPM/NASA AND ISPM/ESA) TRAVEL TO JUPITER WITH A CLOSE ENCOUNTER IN MAY 1984, THEN ONE SPACECRAFT IS PLACED INTO A NORTH TRAJECTORY (RELATIVE TO THE SOLAR ECLIPTIC) AND THE OTHER INTO A SOUTH TRAJECTORY. THE JUPITER ENCOUNTER TAKES BOTH SPACECRAFT JUST INSIDE 10'S CRIBIT. AFTER JUPITER FLYBY, BOTH SPACECRAFT TRAVEL IN HELIOCENTRIC OUT OF ECLIPTIC ORBITS WITH HIGH HELIOGRAPHIC INCLINATION AND PASS OVER THE ROTATIONAL POLES OF THE SUN. SPACECRAFT DESIGN IS STILL UNDER STUDY. A JOINT NASA/ESA RADIO SCIENCE TEAM CONDUCTS INDIVIDUAL INVESTIGATIONS IN ADDITION TO THE SEPARATE EXPERIMENTS. THE MISSIONS INCLUDE THEORETICAL AND INTERDISCIPLINARY INVESTIGATIONS. THE SCIENTISTS FOR THESE INVESTIGATIONS ARE LISTED IN APPENDIX B.

\*\*\*\*\* ISPM/ESA, BARE \*\*\*\*\*

INVESTIGATION NAME- PLASMA SPECTROMETER

NSSDC ID- ISPESA -05 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - S.J.	BARE
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LOS ALAMOS SCI LAB

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) INVESTIGATE AND ESTABLISH BULK FLOW PARAMETER AND INTERNAL STATE VARIATIONS OF THE SOLAR WIND AS A FUNCTION OF SOLAR LATITUDE; (2) INVESTIGATE RADIAL VARIATIONS OF SOLAR WIND PROPERTIES BETWEEN EARTH AND JUPITER; AND (3) INVESTIGATE THE SOLAR WIND INTERACTION WITH THE JOVIAN MAGNETOSPHERE. THE INSTRUMENT CONSISTS OF TWO SENSOR SYSTEMS, ASSOCIATED ELECTRONICS, AND INTERFACES WITH THE SPACECRAFT. ELECTRONS ARE MEASURED BY A 125-DEG SPHERICAL SECTION ELECTROSTATIC ANALYZER WITH 7 CHANNEL ELECTRON MULTIPLIERS (CEM'S) WHICH COVER A POLAR ANGLE RANGE OF 146 DEG. THE ANALYZER IS ENCLOSED IN A LIGHT-TIGHT PACKAGE WITH AN ENTRANCE APERTURE OF 1 CM WIDTH.

\*\*\*\*\* IR ASTRON, SAT. \*\*\*\*\*

SPACECRAFT COMMON NAME- IR ASTRON, SAT.  
ALTERNATE NAMES- INFRA-RED ASTRONOMY SAT, IRAS

NSSDC ID- IRAS

LAUNCH DATE- 02/10/82 WEIGHT- 1000. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

THE NETHERLANDS	NIVR
UNITED STATES	NASA-GSFC
UNITED KINGDOM	SRC

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	INCLINATION- 99. DEG
ORBIT PERIOD- 103.1 MIN	APOAPSIS- 900. KM ALT
PERIAPSIS- 900. KM ALT	

PERSONNEL

MG - W.S.	LOGAN, JR.	NASA HEADQUARTERS
SC - H.W.	BOGGESS	NASA HEADQUARTERS
PM - E.K.	CASANI	NASA-JPL
PS - H.H.	AUHMANN	NASA-JPL

BRIEF DESCRIPTION

THE INFRARED ASTRONOMICAL SATELLITE (IRAS) IS A MISSION WITH JOINT EXECUTION BY THE UNITED STATES (NASA), THE NETHERLANDS, AND THE UNITED KINGDOM. THE BASIC GOAL OF THIS PLANNED 1-YEAR MISSION IS TO OBTAIN A DEEP, FULL-SKY SURVEY OVER THE APPROXIMATE WAVELENGTH RANGE 8-500 MICRONS WITH FIVE BROAD-BAND PHOTOMETRY CHANNELS. THE IRAS CONTAINS A 0.6-METER BRITELEY-CHRETIEN TELESCOPE COOLED BY HELIUM TO A TEMPERATURE OF NEAR 10 DEG K. AN ARRAY OF ABOUT 100 DETECTORS IS USED TO DETECT THE INFRARED FLUX IN BANDS CENTERED AT 10-, 20-, 50-, AND 100 MICRONS. THE SENSITIVITY OF THE INSTRUMENT IS RESTRICTED BY THE PHOTON FLUCTUATIONS FROM THE ZODIACAL LIGHT. THE POSITIONS OF GALACTIC AND EXTRAGALACTIC SOURCES ARE DETERMINED TO AN ACCURACY OF 0.5 ARC MIN. IN ADDITION TO THE FOCAL-PLANE DETECTOR ARRAY USED FOR THE ALL-SKY SURVEY, BOTH A LOW-RESOLUTION SPECTROGRAPHIC AND A LONG-WAVELENGTH (GREATER THAN 100 MICRONS) PHOTOMETRIC CAPABILITY ARE INCLUDED ON THE IRAS. THE IRAS IS FLOWN IN A 900-KM ORBIT, WITH AN INCLINATION NEAR 99 DEG. TO EFFECT THE SCANNING OF THE SKY NEEDED FOR THE SURVEY, THE SATELLITE IS ROTATED AT A CONSTANT ANGULAR VELOCITY AROUND THE SUN VECTOR IN THE DIRECTION OF THE ORBITAL ANGULAR VELOCITY. THE IRAS IS ALSO ABLE TO DO POINTED OBSERVATIONS. HERE THE IRAS CAN BE POINTED AT A SELECTED CELESTIAL OBJECT FOR UP TO 17 MIN. THIS POINTING ABILITY PERMITS VERY SENSITIVE MEASUREMENTS ON THE FAINTER GALACTIC AND EXTRAGALACTIC SOURCES. THE SCIENCE WORKING GROUP IS LISTED IN APPENDIX B.

\*\*\*\*\* IRM, HAERENDEL \*\*\*\*\*

SPACECRAFT COMMON NAME- IRM  
ALTERNATE NAMES- ION RELEASE MODULE, AMPTE/ION RELEASE MODULE

NSSDC ID- IRM

LAUNCH DATE- 09/13/83 WEIGHT- 600. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-GSFC
FED REP OF GERMANY	MP

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	INCLINATION- 28.5 DEG
ORBIT PERIOD- 3102.5 MIN	APOAPSIS- 127560. KM ALT
PERIAPSIS- 300. KM ALT	

PERSONNEL

PM - U.	JONELEIT	DFVLR
PM - G.W.	OUSLEY	NASA-GSFC
PS - G.	HAERENDEL	MPI-EXTRATELL PHYS

BRIEF DESCRIPTION

THIS SPACECRAFT CARRIES SIX LI AND FOUR BA ION RELEASE CANNISTERS ALONG WITH A SUN SENSOR AND 3-AXIS MAGNETOMETER ATTITUDE DETERMINATION SYSTEM. THE POWER SYSTEM CONSISTS OF SOLAR PANELS TO PROVIDE 80 W, AND A BATTERY. THE SPACECRAFT SPIN STABILIZES AT 30 RPM. THE THERMAL SYSTEM EMPLOYS ACTIVE HEATERS AND MULTILAYER INSULATION. THE SCHOENSTEDT MAGNETOMETER IS A 0.5 W S-BAND TRANSMITTER. THE SCHOENSTEDT MAGNETOMETER IS SENSITIVE TO FIELDS FROM 0.5 TO 1.004 NT AND IS THE ONLY DETECTION INSTRUMENT ON BOARD. IONS RELEASED ARE TO BE DETECTED BY INSTRUMENTS ON THE CCE SPACECRAFT. THE SCIENTIFIC TEAM IS LISTED IN APPENDIX B.

THE GAP WIDTH IS 0.30 CM AND THE AVERAGE RADIUS OF CURVATURE IS 4.5 CM. THE ANALYZER HAS A GEOPETRIC FACTOR (G) OF 0.7 E-3 SO CM-SR. THE SOLAR WIND ION ANALYZER MAKES THREE-DIMENSIONAL MEASUREMENTS OF SOLAR WIND IONS WITH ENERGIES IN THE RANGE BETWEEN 207 EV AND 35 KEV PER CHARGE. IT CONSISTS OF A 130-DEG SPHERICAL SECTION ELECTROSTATIC ANALYZER FITTED WITH 17 CEF SENSORS WHICH COVER A POLAR ANGLE RANGE OF 80 DEG. IT IS MOUNTED SO THAT ONE EDGE OF ITS POLAR ANGLE OF ACCEPTANCE IS PARALLEL TO THE SPIN AXIS. A STEPPING MOTOR IS USED TO ROTATE ANY ONE OF SEVEN APERTURES INTO PLACE. THE MASS OF THE ELECTRON INSTRUMENT IS 2.35 KG. IT USES 2 W MEAN AND 3 W PEAK, AND HAS A DATA RATE OF 20 BPS IN CRUISE MODE AND 40 BPS IN TRACKING MODE. THE MASS OF THE ION INSTRUMENT IS 6.62 KG. IT USES 4 W MEAN AND 10 W PEAK, AND HAS A DATA RATE OF 90 BPS IN CRUISE MODE AND 100 BPS IN TRACKING MODE.

----- ISPM/ESA, ESPOSITO -----

INVESTIGATION NAME- RADIO SCIENCE

NSSDC ID- ISPESA -09 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES AND RADIO PHYSICS  
SOLAR PHYSICS

PERSONNEL

PI - P.D. ESPOSITO	NASA-JPL
TM - H.E. VOLLAND	U OF MUNN
TM - D. BERTOTTI	U OF PAVIA
TM - P.C. CALLAHAN	NASA-JPL

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO UTILIZE THE ISPM/ESA SPACECRAFT AND THE NASA DEEP SPACE NETWORK FOR DIFFERENT STUDIES CONDUCTED BY INDIVIDUAL MEMBERS OF THE RADIO SCIENCE TEAM. STUDIES INCLUDE THE FOLLOWING: (1) DETERMINE THE CORONAL, INTEGRATED ELECTRON DENSITY AND THE GLOBAL CORONAL ELECTRON DENSITY AS A FUNCTION OF HELIOCENTRIC RADIAL DISTANCE AND LATITUDES; (2) INVESTIGATE THE MAGNITUDE AND LOCATION OF CHANGES IN THE ELECTRON DENSITY ALONG THE LINE OF SIGHT TO DETERMINE THE STRUCTURE AND TIME HISTORY OF DENSITY FLUCTUATIONS IN THE SOLAR WINDS; AND (3) DETERMINE THE VELOCITY OF THE SOLAR WIND CLOSE TO THE SUN, AND DETERMINE THE STRUCTURE OF THE CORONAL ELECTRON DENSITY CLOSE TO THE SUN. IN ADDITION, THERE ARE SEVERAL OTHER INVESTIGATIONS WHICH ARE UNDER STUDY.

----- ISPM/ESA, GLOECKLER -----

INVESTIGATION NAME- SOLAR-WIND COMPOSITION SPECTROMETER

NSSDC ID- ISPESA -04 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - G. GLOECKLER	U OF MARYLAND
DI - J. GEISS	U OF BERNE

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO STUDY THE ELEMENTAL AND IONIC-CHARGE COMPOSITION AND THE TEMPERATURES AND MEAN SPEEDS OF ALL MAJOR SOLAR WIND IONS FROM H THROUGH Fe. THE INSTRUMENT CONSISTS OF A DEFLECTION ASSEMBLY, HIGH VOLTAGE BUBBLE CONTAINING ANALOG ELECTRODES, A POST-ACCELERATION 50 KV SUPPLY, A POINTING DEVICE, AND ELECTRONICS FOR DATA PROCESSING AND POWER CONVERSION. THE INSTRUMENT HAS A MASS OF 4.5 KG, USES 3.6 W MEAN AND 13.6 W PEAK POWER, AND HAS A DATA RATE OF 43 BPS IN CRUISE MODE AND 86 BPS IN TRACKING MODE.

----- ISPM/ESA, GRUN -----

INVESTIGATION NAME- COSMIC DUST

NSSDC ID- ISPESA -07 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
DUST

PERSONNEL

PI - E. GRUN	MPI-NUCLEAR PHYS
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BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO INVESTIGATE PARTICULATE MATTER WITH MASSES BETWEEN 1.E-16 G AND 1.E-7 G IN THE HELIOSPHERE. DETERMINE ITS PHYSICAL AND DYNAMICAL PROPERTIES AS A FUNCTION OF ECLIPSTIC LATITUDE AND HELIOCENTRIC DISTANCES, AND INVESTIGATE ITS INTERACTION WITH OTHER INTERPLANETARY/INTERSTELLAR PHENOMENA SUCH AS SOLAR RADIATION, SOLAR WIND, HELIOSPHERIC MAGNETIC FIELD, AND INTERSTELLAR NEUTRAL GAS. THIS INSTRUMENT COMPRISES A SENSOR WITH CHANNELTRON AND ASSOCIATED ELECTRONICS SUCH AS PREAMPLIFIERS, SIGNAL CONDITIONERS, AND SPACECRAFT INTERFACE UNITS. THE INSTRUMENT HAS A MASS OF 2.7 KG AND USES 1.5 W OF POWER. THE DATA RATE IS 3 MPS.

----- ISPM/ESA, HEDGECOCK -----

INVESTIGATION NAME- MAGNETIC FIELD

NSSDC ID- ISPESA -08 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS

PERSONNEL

PI - P.C. HEDGECOCK	IMPERIAL COLLEGE
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BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO INVESTIGATE THE STRENGTH AND GEOMETRY OF THE INTERPLANETARY MAGNETIC FIELD IN THE INNER HELIOSPHERE (PARTICULARLY AT HIGH SOLAR LATITUDES) AND TO INVESTIGATE THE HELIOGRAPHIC LATITUDE DEPENDENCE OF THE FIELD FLUCTUATION SPECTRA WITH SPECIAL EMPHASIS ON THE FREQUENCY RANGE BELOW 0.01 Hz. SECONDARY OBJECTIVES ARE TO STUDY THE INTERNAL DYNAMICS OF THE SOLAR WIND; THE ROLE OF DISCONTINUITIES AND WAVES IN THE INTERPLANETARY FIELD ON PROPAGATION AND ACCELERATION OF ENERGETIC PARTICLES; THE INTERPLANETARY PROPAGATION AND DEVELOPMENT OF DISCONTINUITIES AND WAVES; AND THE STRUCTURE AND DYNAMICS OF THE DUSK REGION OF THE JOVIAN MAGNETOSPHERE. THE INSTRUMENT CONSISTS OF A TRIAXIAL FLUXGATE MAGNETOMETER, A VECTOR HELIUM MAGNETOMETER, A BOOM, AND ASSOCIATED ELECTRONICS. THE INSTRUMENT HAS A MASS OF 4.50 KG EXCLUDING THE BOOM. IT HAS A DATA RATE OF 40 BPS IN THE CRUISE MODE AND 80 BPS IN THE TRACKING MODE. IT USES 5.22 W OF POWER.

----- ISPM/ESA, HURLEY -----

INVESTIGATION NAME- SOLAR-FLARE X-RAYS AND COSMIC GAMMA RAY BURST

NSSDC ID- ISPESA -01 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
GAMMA-RAY ASTRONOMY  
X-RAY ASTRONOMY

PERSONNEL

PI - K.C. HURLEY	CESR
DI - M.R. SORNER	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO STUDY THE ACCELERATION AND STORAGE OF ENERGETIC ELECTRONS ACCELERATED DURING SOLAR FLARES BY MEASURING SOLAR X-RADIATION; TO IDENTIFY GAMMA-RAY BURST SOURCES WITH KNOWN CELESTIAL OBJECTS OR PHENOMENA; AND TO STUDY PLASMA AND ENERGETIC CHARGED PARTICLE PROCESSES IN THE JOVIAN MAGNETOSPHERE. THIS INVESTIGATION IS SIMILAR TO THE NASA EXPERIMENT (ISPM/NASA-02 (CLINE)). THE INSTRUMENT CONSISTS OF TWO HEMISPHERICAL CESIUM IODIDE (SODIUM) CRYSTALS COUPLED TO TWO CURVED CATHODE PHOTOMULTIPLIERS; TWO SMALL SOLID-STATE DETECTORS CLOSE TO THE TWO CRYSTALS; WITH AN AMERICIUM 241 RADIOACTIVE SOURCE DEPOSITED ON THE SURFACES OF THE SOLID-STATE DETECTORS; ONE PROPORTIONAL COUNTERS; AND A DIGITAL ELECTRONICS UNIT. THE SCINTILLATION COUNTERS MEASURE X RAYS IN THE ENERGY RANGE FROM 15 KEV TO 150 KEV, WHILE THE PROPORTIONAL COUNTER MEASURES RAYS FROM 5 KEV TO 15 KEV. THE SOLID-STATE DETECTORS ARE USED TO CALIBRATE THE SCINTILLATORS. IN ADDITION, THEY ACT AS BACKUP DETECTORS IN CASE OF A SCINTILLATION COUNTER FAILURE. THE INSTRUMENT HAS A MASS OF 11.17 KG, USES 11.2 W MEAN AND 11.7 W PEAK POWER, AND HAS A DATA RATE OF 80 BPS IN CRUISE MODE AND 160BPS IN TRACKING MODE.

----- ISPM/ESA, LANZEROTTI -----

INVESTIGATION NAME- HELIOSPHERE

NSSDC ID- ISPESA -03 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS

PERSONNEL

PI - L.J. LANZEROTTI	BELL TELEPHONE LAB
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BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) INVESTIGATE THE SOLAR FLARE PROCESS WITH MEASUREMENTS OF NON-RELATIVISTIC AND RELATIVISTIC ELECTRONS, AND NON-RELATIVISTIC IONS, AND THEIR DEPENDENCE ON HELIOLATITUDES; (2) INVESTIGATE SOLAR ELEMENTAL ABUNDANCES WITH MEASUREMENTS OF CHEMICAL AND ISOTOPIC COMPOSITION OF NUCLES OF SOLAR ORIGIN AT ALL HELIOLATITUDES; (3) INVESTIGATE THE INTERPLANETARY PROPAGATION OF SOLAR ENERGETIC PARTICLES BY MEASUREMENT OF ANISOTROPY AND COMPOSITION PARAMETERS; (4) INVESTIGATE ACCELERATION PROCESSES; AND (5) INVESTIGATE TEMPORAL AND SPATIAL VARIATIONS OF PARTICLE INTENSITY IN AND NEAR THE JOVIAN MAGNETOSPHERE. THE INSTRUMENTATION CONSISTS OF THREE SENSORS. THE PRIMARY DETECTOR MEASURES PROTONS AND IONS AT LOW ENERGIES (1.6, 20 KEV) WITH A GEOMETRY FACTOR (G) OF APPROXIMATELY 0.5 50 CM-SR. A BASE EARTH ALLOY MAGNET DEFLECTS ELECTRONS WITH ENERGIES LT. 400 KEV AWAY FROM THE PRIMARY DETECTOR TO SENSOR 2. THE OUTPUT IS FED INTO WINDOW-TYPE DISCRIMINATORS WHICH

PROVIDE 7 PROTON-ION DIFFERENTIAL ENERGY CHANNELS IN THE RANGE FROM 0.02 MEV TO 3.0 MEV. THE OUTPUT IS ALSO PULSE HEIGHT ANALYZED IN SECTORS. SENSOR 2 PROVIDES UNIQUE IDENTIFICATION OF LOW ENERGY (L.E., 15 KEV) ELECTRONS, WITH A G APPROXIMATELY EQUAL TO 0.05 SQ CM-MA. FOUR DIFFERENTIAL ENERGY CHANNELS PROVIDE OUTPUTS OVER THE 16 MEV TO 200 MEV ENERGY RANGE. SENSOR 3 IS BEHIND A NICKEL-FOIL SHIELD, WITH A VIBRATION DIRECTION OPPOSITE TO SENSOR 2. THE FOIL STOPS PROTONS UP TO APPROXIMATELY 0.3 MEV, BUT ALLOWS PENETRATION OF LOW-ENERGY ELECTRONS. ELECTRONS ARE DETECTED FROM 30 KEV TO 400 KEV. PROTONS FROM 0.45 MEV TO 3.0 MEV. THE INSTRUMENT HAS A MASS OF 3.7 KG, A 4 W POWER USAGE, AND A DATA RATE OF 80 BPS IN CRUISE MODE AND 176 BPS IN TRACKING MODE.

----- ISPM/ESA, SIMPSON-----

INVESTIGATION NAME- COSMIC RAY AND CHARGED PARTICLE

NSSDC ID- ISPEA-02 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
COSMIC RAYS

PERSONNEL  
PI - J.A. SIMPSON U OF CHICAGO

#### BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO STUDY THE ENERGY, CHARGE, AND MASS SPECTRA OF ENERGETIC CHARGED PARTICLES IN INTERPLANETARY SPACE IN THE ENERGY RANGE FROM APPROXIMATELY 0.5 MEV/NUCLEON (FOR PROTONS) TO APPROXIMATELY 100 MEV/NUCLEON; AND TO STUDY SPATIAL GRADIENTS AND THE PROPAGATION OF CHARGED PARTICLES THROUGHOUT THE HELIOSPHERE BY MEASURING ABSOLUTE FLUX AND VECTOR ANISOTROPY. THE INSTRUMENT CONSISTS OF SIX CHARGED PARTICLE TELESCOPES (CPT) AND ASSOCIATED ELECTRONICS. THE HIGH ENERGY TELESCOPE PROVIDES MEASUREMENTS OF THE CHEMICAL AND ISOTOPIC COMPOSITION AND OF THE ENERGY SPECTRUM OF THE COSMIC RADIATION ABOVE APPROXIMATELY 10 MEV/NUCLEON. THE LOW ENERGY TELESCOPE (LET) EXTENDS CHEMICAL COMPOSITION AND SPECTRAL MEASUREMENTS DOWNWARDS TO L.E., 1 MEV/NUCLEON. THE ANISOTROPY TELESCOPES, IN CONJUNCTION WITH THE LET, PROVIDE A MEANS OF DETERMINING THE DISTRIBUTION OF ARRIVAL DIRECTIONS IN THREE DIMENSIONS OF LOW ENERGY PROTONS AND HE NUCLEI. THE HIGH FLUX TELESCOPE PROVIDES MEASUREMENTS OF THE INTENSITY AND ARRIVAL DIRECTION OF PROTONS, HELIUM, CNO, AND FE GROUP NUCLEI IN HIGH FLUX ENVIRONMENTS, SUCH AS INTENSE SOLAR FLARES OR JUPITER'S MAGNETOSPHERE, WHERE THE OTHER SENSOR SYSTEMS MAY BECOME SATURATED. EACH CPT PROVIDES OUTPUT TO A DATA PROCESSING UNIT (DPU). THE ELECTRON TELESCOPE CONSISTS OF A ONE DOUBLE CERENKOV AND SEMICONDUCTOR DETECTOR TELESCOPE WHICH INTERFACE WITH THE DPU. THE INSTRUMENT HAS A MASS OF 11.17 KG AND USES 11.2 W MEAN AND 11.7 W PEAK POWER. THE DATA RATE IS 80 BPS IN CRUISE MODE AND 160 BPS IN TRACKING MODE.

----- ISPM/ESA, STONE-----

INVESTIGATION NAME- UNIFIED RADIO AND PLASMA WAVE

NSSDC ID- ISPEA-06 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SOLAR PHYSICS

PERSONNEL  
PI - R.H. STONE NASA-GSFC

#### BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) INVESTIGATE SOURCE POSITIONS OF RADIATING SOLAR RADIO BURSTS IN THE RANGE FROM DC TO 1 MHZ; (2) INVESTIGATE THE LARGE-SCALE MAGNETIC FIELD TOPOLOGY AND THE ELECTRON DENSITY ALONG THE EXCITER TRAJECTORY AS A FUNCTION OF HELIOGRAPHIC LATITUDE AND LONGITUDE AT DISTANCES OF 0.1 AU TO APPROXIMATELY 5 AU; (3) INVESTIGATE JOVIAN RADIO SOURCE LOCATIONS IN THE RANGE FROM DC TO 1 MHZ; AND (4) INVESTIGATE WAVES IN THE PLASMA BETWEEN DC AND 30 KHZ, THEIR INSTABILITIES, THEIR ENERGY TRANSPORT MECHANISMS, AND THE THERMAL ELECTRON DENSITY. THIS INVESTIGATION OPERATES IN CONJUNCTION WITH THE SIMILAR INVESTIGATION ISPM/NASA-05 (STCNE). THE INSTRUMENT COMPRISSES THREE ANTENNA SYSTEMS (A 70-M TIP-TO-TIP DIPOLE IN THE EQUATORIAL PLANE, A MONPOLE ALONG THE SPIN AXIS, AND A PAIR OF CROSSED-AXIS MAGNETIC SEARCH COILS LOCATED IN THE EQUATORIAL PLANE) AND FOUR RECEIVER SYSTEMS (AN RF RECEIVER FOR 5 KHZ TO 1 MHZ IN TWO INTERVALS FROM 5 TO 30 KHZ AND FROM 30 KHZ TO 1 MHZ; A PLASMA FREQUENCY RECEIVER COVERING FROM 0.5 KHZ TO 30 KHZ IN 32 CONTINUOUS INTERVALS; A FAST ENVELOPE SAMPLER 0.2 KHZ TO 60 KHZ WITH FOUR COMMANDABLE DECADE RANGES TO CAPTURE TRANSIENT EVENTS; AND A WAVE FORM ANALYZER, DC TO 1 MHZ, THAT OPERATES IN TWO FREQUENCY BANDS, FROM DC TO 10 MHZ AND FROM 10 MHZ TO 1 MHZ). THE INSTRUMENT HAS A MASS OF 4.86 KG, EXCLUDING ANTENNAS AND BOOMS, AND HAS A DATA RATE OF 116 BPS. IT USES 8.22 W OF POWER.

----- ISPM/NASA-01 ISPM/ESA-----

SPACERCRAFT COMMON NAME- ISPM/NASA  
ALTERNATE NAMES- ISPM-A, ISP  
INT SOLAR POLAR, SOLAR POLAR

NSSDC ID- ISPM-A

LAUNCH DATE- 03/27/80 WEIGHT- 490. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- HELIOCENTRIC  
ORBIT PERIOD- 2020. DAYS  
PERIASTRIS- 1.0 AU RAD INCLINATION- 70. DEG  
APOGYPSIS- 5.24 AU RAD

PERSONNEL  
RG - R.E. RONALD NASA HEADQUARTERS  
PM - H.W. NORRIS NASA-JPL

#### BRIEF DESCRIPTION

THE PRIMARY OBJECTIVES OF THE INTERNATIONAL SOLAR POLAR MISSION (ISP) ARE FOR TWO SPACERCRAFT TO INVESTIGATE, AS A FUNCTION OF SOLAR LATITUDE, THE PROPERTIES OF THE SOLAR CORONA, THE SOLAR WIND, THE STRUCTURE OF THE SUN-WIND INTERFACE, THE HELIOSPHERIC MAGNETIC FIELD, SOLAR AND NON-SOLAR COSMIC RAYS, SOLAR RADIO BURSTS AND PLASMA WAVES, AND THE INTERSTELLAR/INTERPLANETARY NEUTRAL GAS AND DUST. SECONDARY OBJECTIVES INCLUDE INTERPLANETARY PHYSICS INVESTIGATIONS DURING THE INITIAL EARTH-JUPITER PHASE, WHEN THE SEPARATION OF THE ESA AND THE NASA SPACERCRAFT IS APPROXIMATELY 0.01 AU, AND MEASUREMENTS OF THE JOVIAN MAGNETOSPHERE DURING THE JUPITER FLYBY PHASE. THE TWO SPACERCRAFT FOR THIS MISSION (ISPM/NASA AND ISPM/ESA) TRAVEL TO JUPITER WITH A CLOSE ENCOUNTER IN MAY 1984, THEN ONE SPACERCRAFT IS PLACED INTO A NORTH TRAJECTORY (RELATIVE TO THE SOLAR ELLIPTIC) AND THE OTHER INTO A SOUTH TRAJECTORY. THE JUPITER ENCOUNTER TAKES BOTH SPACERCRAFT JUST INSIDE IO'S ORBIT. AFTER JUPITER FLYBY, BOTH SPACERCRAFT TRAVEL IN HELIOCENTRIC OUT OF ELLIPTIC ORBITS WITH HIGH HELIOGRAPHIC INCLINATION AND PASS OVER THE ROTATIONAL POLES OF THE SUN. SPACERCRAFT DESIGN IS STILL UNDER STUDY. A JOINT NASA/ESA RADIO SCIENCE TEAM CONDUCTS INDIVIDUAL INVESTIGATIONS IN ADDITION TO THE SEPARATE EXPERIMENTS. THE MISSIONS INCLUDE THEORETICAL AND INTERDISCIPLINARY INVESTIGATIONS. THE SCIENTISTS FOR THESE INVESTIGATIONS ARE LISTED IN APPENDIX B.

----- ISPM/NASA, ACUNA-----

INVESTIGATION NAME- MAGNETIC FIELD (MAG)

NSSDC ID- ISPNASA-06 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - R.H. ACUNA NASA-GSFC

#### BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION (MAG) IS TO MEASURE THE JOVIAN AND INTERPLANETARY VECTOR MAGNETIC FIELD TO INVESTIGATE THE LARGE-SCALE THREE-DIMENSIONAL STRUCTURE OF THE HELIOSPHERIC FIELD, ITS SOLAR ORIGIN, AND ITS SMALL-SCALE CHARACTERISTICS. THE MAG HAS A TIME RESOLUTION OF UP TO 20 VECTORS/S, A PRECISION OF 0.025 PERCENT, AN ACCURACY OF 0.17 NT, A SENSITIVITY OF 0.004 NT, AND A DYNAMIC RANGE OF PLUS OR MINUS 4.096 NT. MAG USES A TRIAXIAL FLUORGATE MAGNETOMETER MOUNTED NEAR THE TIP OF A BOOM WITH AN INBOARD SENSOR MOUNTED ABOUT HALFWAY TO TWO-THIRDS ALONG THE BOOM LENGTH. NORMAL DATA MODE IS 1 VECTOR/S WITH AN AUTOMATIC SWITCH TO 20 VECTORS/S BASED ON THE CHARACTERISTICS OF DATA OBSERVED IN THE PRECEDING PERIOD OF TIME. THE INSTRUMENT HAS A MASS OF 3.12 KG, USES 1.5 W OF POWER, AND HAS A BIT RATE OF 11 TO 220 BPS IN CRUISE MODE AND 26 TO 920 BPS IN TRACKING MODE. 20 VECTOR DATA ARE STORED FOR LATER (SLOWER) TRANSMISSION.

----- ISPM/NASA, CLINE-----

INVESTIGATION NAME- SOLAR X-RAY FLARE AND COSMIC-RAY BURST (XCRB)

NSSDC ID- ISPNASA-02 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
GAMMA-RAY ASTRONOMY  
X-RAY ASTRONOMY

PERSONNEL  
PI - T.L. CLINE NASA-GSFC



NSSDC ID- LAND-D

LAUNCH DATE- 03/31/82 WEIGHT- 1407. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES NASA-GSTA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 99.3 MIN  
PERIAPSIS- 705. KM ALT

INCLINATION- 98.2 DEG  
APOAPSIS- 705. KM ALT

PERSONNEL

MG - H. MANNHEIMER  
SC - J.R. MORRISON  
PM - E.E. SPEAKER  
PS - V.V. SALOMONSON

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE LANDSAT-D SYSTEM IS AN EXPERIMENTAL EARTH RESOURCES MONITORING SYSTEM WITH THE NEW POWERFUL REMOTE SENSING CAPABILITIES OF THE THEMATIC MAPPER (TM) AND PROVIDES A TRANSITION FOR BOTH FOREIGN AND DOMESTIC USERS FROM THE MULTISPECTRAL SCANNER (MSS) DATA (WHICH WILL ALSO BE PART OF THE INSTRUMENT PACKAGE) TO THE HIGHER RESOLUTION AND DATA RATE OF THE TM. IT HAS A COMPLETE END-TO-END HIGHLY AUTOMATED DATA SYSTEM, WHICH IS DESIGNED TO BE A NEW GENERATION SYSTEM, AND IS A MAJOR STEP FORWARD IN GLOBAL REMOTE-SENSING APPLICATIONS. THE LANDSAT-D MISSION CONSISTS OF AN ORBITING SATELLITE (SPACE SEGMENT) WITH THE NECESSARY WIDEBAND DATA LINKS AND SUPPORT SYSTEMS, AND A GROUND SEGMENT. THE LANDSAT-D SPACE SEGMENT CONSISTS OF TWO MAJOR SYSTEMS: (1) THE INSTRUMENT MODULE, CONTAINING THE INSTRUMENTS TOGETHER WITH THE MISSION UNIQUE SUBSYSTEMS, SUCH AS THE SOLAR ARRAY AND DRIVE, THE TORS ANTENNA, THE WIDE-BAND MODULE (WBM), AND THE GLOBAL POSITIONING SYSTEM (GPS); AND (2) THE MULTIMISSION MODULAR SPACECRAFT (MMS) THAT CONTAINS THE MODULARIZED AND STANDARDIZED POWER, PROPULSION, ATTITUDE CONTROL, AND COMMUNICATIONS AND DATA HANDLING SUBSYSTEMS. WHEN THE LANDSAT-D SATELLITE IS LAUNCHED, IT IS DEPLOYED AT AN ORBITAL ALTITUDE OF 705.3 KM, INCLINATION OF 98.2 DEG, AND A SUN ANGLE OF 9:30 A.M. AT THE DESCENDING NODE. THIS ORBIT HAS A FREQUENCY OF 19-9/16 ORBITS PER DAY AND COVERS THE EARTH IN 16 DAYS. THE DISTANCE BETWEEN GROUND TRACKS IS 172 KM, WHICH WHEN USED IN CONJUNCTION WITH THE 185-KM TM AND MSS SENSORS SWATH WIDTH, PROVIDES AN OVERLAP OF 7.6 PERCENT. THE SPACE SEGMENT IS DESIGNED WITH 3 YEARS NOMINAL LIFE TIME IN ORBIT AND CAN BE EXTENDED THROUGH IN-ORBIT REPLACEMENT LIFECYCLE WHEN THE SHUTTLE IS OPERATIONAL. THE SPACECRAFT AND ATTENDANT SENSORS WILL BE OPERATED THROUGH THE TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS).

----- LANDSAT-D, BANKS-----

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- LAND-D-02 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL

PI - G.F. BANKS

NASA-GSFC

BRIEF DESCRIPTION

THE LANDSAT D MULTISPECTRAL SCANNER (MSS) PROVIDES REPETITIVE DAY/NIGHT ACQUISITION OF HIGH-RESOLUTION MULTISPECTRAL DATA OF THE EARTH'S SURFACE ON A GLOBAL BASIS. WHILE ITS PRIMARY FUNCTION IS TO PROVIDE AN ALTERNATE DATA TO THE THEMATIC MAPPER (TM), IT PROVIDES DATA IN AREAS SUCH AS AGRICULTURE, FORESTRY, GEOLOGY, AND HYDROLOGY. THE MSS SYSTEM IS ALSO USED FOR OCEANOGRAPHIC AND METEOROLOGICAL PURPOSES, I.E., TO MAP SEA-ICE, FIELDS, LOCATE AND TRACK MAJOR OCEAN CURRENTS, MONITOR BOTH AIR AND LATER POLLUTION, DETERMINE SNOW COVER, INVESTIGATE SEVERE STORM ENVIRONMENTS, ETC. THE MSS CONSISTS OF A DOUBLE REFLECTION-TYPE TELESCOPE, SCANNING MIRROR, FILTERS, DETECTORS, AND ASSOCIATED ELECTRONICS. THE SCANNER OPERATES IN THE FOLLOWING SPECTRAL INTERVALS -- BAND 1 - 0.5 TO 0.6 MICROMETERS, BAND 2 - 0.6 TO 0.7 MICROMETERS, BAND 3 - 0.7 TO 0.8 MICROMETERS, BAND 4 - 0.8 TO 1.1 MICROMETERS, AND BAND 5 - 10.4 TO 12.6 MICRUMETERS. THIS LAST BAND, WHICH LIES IN THE THERMAL (EMISSIVE) PART OF THE SPECTRUM, PROVIDES NIGHTTIME SENSING CAPABILITIES. LANDSAT D MSS IS SIMILAR TO LANDSAT 3 MSS EXCEPT FOR CHANGES NECESSARY TO ACCOMMODATE THE LOWER ORBITAL ALTITUDE. THE SWATH WIDTH OF 195 KM WILL REMAIN THE SAME BY INCREASING THE FOV OF THE SENSORS FROM 11.56 TO 14.92 DEG. THE GROUND RESOLUTION WILL BE 82.6 M FOR BANDS 1 THROUGH 4 AND 248 M FOR BAND 5. THE PRIMARY IMAGE PRODUCED AT THE IMAGE PLANE IS RELAYED BY USE OF FIBER-OPTIC BUNDLES TO DETECTORS WHERE CONVERSION TO AN ELECTRONIC SIGNAL IS ACCOMPLISHED. OPTICAL FILTERS PRODUCE SPECTRAL SEPARATION. SIX DETECTORS ARE EMPLOYED IN EACH OF THE FIRST FOUR SPECTRAL BANDS AND TWO IN THE FIFTH BAND -- BANDS 1 THROUGH 3 USE PHOTOMULTIPLIER TUBES AS DETECTORS, BAND 4 USES SILICON PHOTOVOLTIODES, AND BAND 5 USES MERCURY-CADMIUM-TELLURIDE DETECTORS. A MULTIPLEXER INCLUDED IN THE MSS SYSTEM PROCESSES THE SCANNER'S 26 CHANNELS OF DATA. THESE DATA ARE TIME-MULTIPLEXED AND THEN CONVERTED TO A PCM SIGNAL BY AN A/D CONVERTER. THE DATA ARE TRANSMITTED DIRECTLY TO AN ACQUISITION STATION VIA THE TDRSS. DATA FROM THIS EXPERIMENT ARE HANDLED BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD, AND

ARE AVAILABLE TO APPROVED INVESTIGATORS THROUGH ITS LANDSAT USERS SERVICES. ALL OTHER INTERESTED INDIVIDUALS ARE TO OBTAIN DATA THROUGH THE EARTH RESOURCES DATA CENTER, DEPARTMENT OF THE INTERIOR, SIOUX FALLS, SD.

----- LANDSAT-D, FEINBERG-----

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)

NSSDC ID- LAND-D-03 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
NAVIGATION

PERSONNEL

PI - P.M. FEINBERG

NASA-GSFC

BRIEF DESCRIPTION

THE GLOBAL POSITIONING SYSTEM (GPS) IS A DEPARTMENT OF DEFENSE (DOD) PROGRAM TO PROVIDE VERY PRECISE POSITION AND TIMING INFORMATION TO A VARIETY OF USERS. THE GPS ASSEMBLY ON LANDSAT-D OPERATES IN TWO PHASES. IN THE FIRST PHASE (APPROXIMATELY 90 DAYS) IS AN EXPERIMENTAL ONE TO VALIDATE AND CALIBRATE THE POSITION AND TIMING INFORMATION PROVIDED BY THE GPS ASSEMBLY. THE SECOND PHASE CALLS FOR OPERATIONAL USE OF THE GPS DATA BY LANDSAT-D.

----- LANDSAT-D, WEINSTEIN-----

INVESTIGATION NAME- THEMATIC MAPPER

NSSDC ID- LAND-D-01 INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL

PI - D. WEINSTEIN

NASA-GSFC

BRIEF DESCRIPTION

THE THEMATIC MAPPER (TM) IS A SEVEN-BAND, EARTH-LOOKING, SCANNING RADIOMETER WITH A 30-M GROUND ELEMENT RESOLUTION COVERING A 185-KM GROUND SWATH FROM A 705-KM ALTITUDE. THE INSTRUMENT CONSISTS OF PRIMARY IMAGING OPTICS, SCANNING MECHANISM, SPECTRAL BAND DISCRIMINATION OPTICS, DETECTOR ARRAYS, RADIATIVE COOLER, IN-FLIGHT CALIBRATOR, AND REQUIRED OPERATING AND PROCESSING ELECTRONICS. THE SCANNING MECHANISM PROVIDES THE CROSS-TRACK SCAN WHILE THE PROGRESS OF THE SPACECRAFT PROVIDES THE SCAN ALONG THE TRACK. THE OPTICAL SYSTEM IMAGES THE EARTH'S SURFACE ON A FIELD STOP OR A DETECTOR SIZED TO DEFINE AN AREA ON THE EARTH'S SURFACE 30 M SQ. SEVERAL LINES ARE SCANNED SIMULTANEOUSLY TO PERMIT SUITABLE DWELL TIME FOR EACH RESOLUTION ELEMENT. THE VARIATION IN RADIANT FLUX PASSING THROUGH THE FIELD STOP ONTO THE PHOTO AND THERMAL DETECTORS CREATES AN ELECTRICAL OUTPUT THAT REPRESENTS THE RADIANT HISTORY OF THE LINE. SEVEN SPECTRAL BANDS ARE USED TO PROVIDE THE SPECTRAL SIGNATURE CAPABILITY OF THE INSTRUMENT. THE INFORMATION OUTPUTS FROM THE DETECTOR CHANNELS ARE PROCESSED IN THE TM MULTIPLEXER FOR TRANSMISSION VIA THE TRACKING AND DATA RELAY SATELLITES (TDRS) AND/OR DIRECT READOUT TO LOCAL RECEIVING STATIONS.

\*\*\*\*\* LANDSAT-D-01\*\*\*\*\*

SPACECRAFT COMMON NAME- LANDSAT-D-01  
ALTERNATE NAMES- LAND SATELLITE-E

NSSDC ID- LAND-E

LAUNCH DATE- 1983 WEIGHT- 1407. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSTA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 99.3 MIN  
PERIAPSIS- 705.3 KM ALT

INCLINATION- 98.2 DEG  
APOAPSIS- 705.3 KM ALT

PERSONNEL

MG - H. MANNHEIMER  
SC - J.R. MORRISON  
PM - E.E. SPEAKER  
PS - V.V. SALOMONSON

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THE LANDSAT-E SYSTEM IS AN EXPERIMENTAL EARTH RESOURCES MONITORING SYSTEM WITH THE NEW POWERFUL REMOTE SENSING CAPABILITIES OF THE THEMATIC MAPPER (TM) AND PROVIDES A TRANSITION FOR BOTH FOREIGN AND DOMESTIC USERS FROM THE MULTISPECTRAL SCANNER (MSS) DATA (WHICH WILL ALSO BE PART OF THE INSTRUMENT PACKAGE) TO THE HIGHER RESOLUTION AND DATA RATE OF THE TM. IT HAS A COMPLETE END-TO-END HIGHLY AUTOMATED DATA SYSTEM, WHICH IS DESIGNED TO BE A NEW GENERATION SYSTEM, AND IS A MAJOR STEP FORWARD IN GLOBAL REMOTE-SENSING APPLICATIONS. THE LANDSAT-E MISSION CONSISTS OF AN ORBITING SATELLITE (SPACE SEGMENT) WITH THE NECESSARY WIDEBAND DATA LINKS AND SUPPORT SYSTEMS, AND A GROUND SEGMENT. THE LANDSAT-E SPACE SEGMENT

CONSISTS OF TWO MAJOR SYSTEMS -- (1) THE INSTRUMENT MODULE, CONTAINING THE INSTRUMENTS TOGETHER WITH THE MISSION UNIQUE SUBSYSTEMS, SUCH AS THE SOLAR ARRAY AND DRIVE; THE TDRS ANTENNA, THE WIDE-BAND MODULE (WBM), AND THE GLOBAL POSITIONING SYSTEM (GPS); AND (2) THE MULTIMISSION MODULAR SPACECRAFT (MMS) THAT CONTAINS THE MODULARIZED AND STANDARDIZED POWER, PROPULSION, ATTITUDE CONTROL, AND COMMUNICATIONS AND DATA HANDLING SUBSYSTEMS. WHEN THE LANDSAT-E SATELLITE IS LAUNCHED, IT IS DEPLOYED AT AN ORBITAL ALTITUDE OF 705.3 KM, INCLINATION OF 98.2 DEG., AND A SUN ANGLE OF 9:30 AM. AT THE DESCENDING NODE. THIS ORBIT HAS A FREQUENCY OF 19-9/16 ORBITS PER DAY AND COVERS THE EARTH IN 16 DAYS. THE DISTANCE BETWEEN GROUND TRACKS IS 172 KM, WHICH WHEN USED IN CONJUNCTION WITH THE 185 KM TM AND MSS SENSORS SWATH WIDTH, PROVIDES AN OVERLAP OF 7.6 PERCENT. THE SPACE SEGMENT IS DESIGNED WITH 3 YEARS NOMINAL LIFE-TIME IN ORBIT AND CAN BE EXTENDED THROUGH IN-ORBIT REPLACEMENT CAPABILITY WHEN THE SHUTTLE IS OPERATIONAL. THE SATELLITE AND ATTENDANT SENSORS WILL BE OPERATED THROUGH THE TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS).

----- LANDSAT-D1, BANKS-----

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)  
NSSDC ID- LAND-E -02      INVESTIGATIVE PROGRAM  
CODE ER  
INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL  
PI - G.F. BANKS      NASA-GSFC

BRIEF DESCRIPTION

THE LANDSAT E MULTISPECTRAL SCANNER (MSS) PROVIDES REPETITIVE DAY/NIGHT ACQUISITION OF HIGH-RESOLUTION MULTISPECTRAL DATA OF THE EARTH'S SURFACE ON A GLOBAL BASIS. WHILE ITS PRIMARY FUNCTION IS TO PROVIDE AN ALTERNATE DATA TO THE THEMATIC MAPPER (TM), IT PROVIDES DATA IN AREAS SUCH AS AGRICULTURE, FORESTRY, GEOLOGY, AND HYDROLOGY. THE MSS SYSTEM IS ALSO USED FOR OCEANOGRAPHIC AND METEOROLOGICAL PURPOSES, I.E., TO MAP SEA-ICE FIELDS, LOCATE AND TRACK MAJOR OCEAN CURRENTS, MONITOR BOTH AIR AND WATER POLLUTION, DETERMINE SNOW COVER, INVESTIGATE SEVERE STORM ENVIRONMENTS, ETC. THE MSS CONSISTS OF A DOUBLE REFLECTION-TYPE TELESCOPE, SCANNING MIRROR, FILTERS, DETECTORS, AND ASSOCIATED ELECTRONICS. THE SCANNER OPERATES IN THE FOLLOWING SPECTRAL INTERVALS -- BAND 1 - 0.5 TO 0.6 MICRORAMETERS, BAND 2 - 0.6 TO 0.7 MICRORAMETERS, BAND 3 - 0.7 TO 0.8 MICRORAMETERS, BAND 4 - 0.8 TO 1.1 MICRORAMETERS, AND BAND 5 - 10.4 TO 12.6 MICRORAMETERS. THIS LAST BAND, WHICH LIES IN THE THERMAL (EMISSIVE) PART OF THE SPECTRUM, PROVIDES NIGHTTIME SENSING CAPABILITIES. LANDSAT D MSS IS SIMILAR TO LANDSAT 3 MSS EXCEPT FOR CHANGES NECESSARY TO ACCOMMODATE THE LOWER ORBITAL ALTITUDE. THE SWATH WIDTH OF 185 KM WILL REMAIN THE SAME BY INCREASING THE FCV OF THE SENSORS FROM 11.56 TO 14.92 DEG. THE GROUND RESOLUTION WILL BE 82.6 M FOR BANDS 1 THROUGH 4 AND 248 M FOR BAND 5. THE PRIMARY IMAGE PRODUCED AT THE IMAGE PLANE IS RELAYED BY USE OF FIBER-OPTIC BUNDLES TO DETECTORS WHERE CONVERSION TO AN ELECTRONIC SIGNAL IS ACCOMPLISHED. OPTICAL FILTERS PRODUCE SPECTRAL SEPARATION. SIX DETECTORS ARE EMPLOYED IN EACH OF THE FIRST FOUR SPECTRAL BANDS AND TWO IN THE FIFTH BAND -- BANDS 1 THROUGH 3 USE PHOTOMULTIPLIER TUBES AS DETECTORS, BAND 4 USES SILICON PHOTODIODES, AND BAND 5 USES MERCURY-CADMIUM-TELLURIDE DETECTORS. A MULTIPLEXER INCLUDED IN THE MSS SYSTEM PROCESSES THE SCANNER'S 26 CHANNELS OF DATA. THESE DATA ARE TIME-MULTIPLEXED AND THEN CONVERTED TO A PCM SIGNAL BY AN A/D CONVERTER. THE DATA ARE TRANSMITTED DIRECTLY TO AN ACQUISITION STATION VIA THE TDRSS. DATA FROM THIS EXPERIMENT ARE HANDLED BY THE NASA DATA PROCESSING FACILITY, GSFC, GREENBELT, MD, AND ARE AVAILABLE TO APPROVED INVESTIGATORS THROUGH ITS LANDSAT USERS SERVICES. ALL OTHER INTERESTED INDIVIDUALS ARE TO OBTAIN DATA THROUGH THE EARTH RESOURCES DATA CENTER, DEPARTMENT OF THE INTERIOR, SIOUX FALLS, SD.

----- LANDSAT-D1, FEINBERG-----

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)  
NSSDC ID- LAND-E -03      INVESTIGATIVE PROGRAM  
CODE ER  
INVESTIGATION DISCIPLINE(S)  
NAVIGATION

PERSONNEL  
PI - P.M. FEINBERG      NASA-GSFC

BRIEF DESCRIPTION

THE GLOBAL POSITIONING SYSTEM (GPS) IS A DEPARTMENT OF DEFENSE (DOD) PROGRAM TO PROVIDE VERY PRECISE POSITION AND TIMING INFORMATION TO A VARIETY OF USERS. THE GPS ASSEMBLY ON LANDSAT-E OPERATES IN TWO PHASES. THE FIRST PHASE (APPROXIMATELY 90 DAYS) IS AN EXPERIMENTAL ONE TO VALIDATE AND CALIBRATE THE POSITION AND TIMING INFORMATION PROVIDED BY THE GPS ASSEMBLY. THE SECOND PHASE CALLS FOR OPERATIONAL USE OF THE GPS DATA BY LANDSAT-D.

----- LANDSAT-D1, WEINSTEIN-----

INVESTIGATION NAME- THEMATIC MAPPER  
NSSDC ID- LAND-E -01      INVESTIGATIVE PROGRAM  
CODE ER  
INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY  
METEOROLOGY

PERSONNEL  
PI - O. WEINSTEIN      NASA-GSFC

BRIEF DESCRIPTION  
THE THEMATIC MAPPER (TM) IS A SEVEN-BAND, EARTH-LOOKING SCANNING RADIOMETER WITH A 30-M GROUND ELEMENT RESOLUTION COVERING A 185-KM GROUND SWATH FROM A 705-KM ALTITUDE. THE INSTRUMENT CONSISTS OF PRIMARY IMAGING OPTICS, SCANNING MECHANISM, SPECTRAL BAND DISCRIMINATION OPTICS, DETECTOR ARRAYS, RADIATIVE COOLER, IN-FLIGHT CALIBRATOR, AND REQUIRED OPERATING AND PROCESSING ELECTRONICS. THE SCANNING MECHANISM PROVIDES THE CROSS-TRACK SCAN WHILE THE PROGRESS OF THE SPACECRAFT PROVIDES THE SCAN ALONG THE TRACK. THE OPTICAL SYSTEM IMAGES THE EARTH'S SURFACE ON A FIELD STOP OR A DETECTOR SIZED TO DEFINE AN AREA ON THE EARTH'S SURFACE 30-M SQ. SEVERAL LINES ARE SCANNED SIMULTANEOUSLY TO PERMIT SUITABLE DWELL TIME FOR EACH RESOLUTION ELEMENT. THE VARIATION IN RADIANT FLUX PASSING THROUGH THE FIELD STOP ONTO THE PHOTO AND THERMAL DETECTORS CREATES AN ELECTRICAL OUTPUT THAT REPRESENTS THE RADIANT HISTORY OF THE LINE. SEVEN SPECTRAL BANDS ARE USED TO PROVIDE THE SPECTRAL SIGNATURE CAPABILITY OF THE INSTRUMENT. THE INFORMATION OUTPUTS FROM THE DETECTOR CHANNELS ARE PROCESSED IN THE TM MULTIPLEXER FOR TRANSMISSION VIA THE TRACKING AND DATA RELAY SATELLITES (TDRS) AND/OR DIRECT READOUT TO LOCAL RECEIVING STATIONS.

----- METEOSAT 2-----

SPACECRAFT COPON NAME- METEOSAT 2  
ALTERNATE NAMES- METEOROLOGICAL SAT-B, METEOSAT-B

NSSDC ID- METOS-B  
LAUNCH DATE- 12/15/80      WEIGHT- 625.8 KG  
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE  
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY  
INTERNATIONAL      ESA

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 1440. MIN      INCLINATION- 0. DEG  
PERIAPSIS- 35600. KM ALT      APOAPSIS- 35600. KM ALT

PERSONNEL  
RG - M. DELAHAIIS      ESA-ESTEC  
PM - D. LENNERTZ      ESA-ESTEC

BRIEF DESCRIPTION  
METEOSAT-B IS GEOSTATIONARY SPACECRAFT AND SERVES AS PART OF EUROPEAN SPACE AGENCY'S (ESA) CONTRIBUTION TO GARP. AS PART OF GARP, THE SATELLITE HELPS TO SUPPLY DATA REQUIRED FOR GLOBAL DATA SETS USED IN IMPROVEMENT OF MACHINE WEATHER FORECASTS. IN GENERAL, THE SPACECRAFT DESIGN, INSTRUMENTATION, AND OPERATION ARE SIMILAR TO SMS/GOES. THE SPIN-STABILIZED SPACECRAFT CARRIES (1) A VISIBLE-IR RADIOMETER TO PROVIDE HIGH-QUALITY DAY/NIGHT CLUCCUBCOVER DATA AND TO TAKE RADIANCE TEMPERATURES OF THE EARTH/ATMOSPHERE SYSTEM, (2) A METEOROLOGICAL DATA COLLECTION SYSTEM TO DISSEMINATE IMAGE DATA TO USER STATIONS, TO COLLECT DATA FROM VARIOUS EARTH-BASED PLATFORMS, AND TO RELAY DATA FROM POLAR-ORBITING SATELLITES. THE CYLINDRICALLY-SHAPED SPACECRAFT MEASURES 210 CM IN DIAMETER AND 430 CM IN LENGTH, INCLUDING THE APOGEE BOOST MOTOR. THE PRIMARY STRUCTURAL MEMBERS ARE AN EQUIPMENT PLATFORM AND A CENTRAL TUBE. THE RADIOMETER TELESCOPE IS MOUNTED ON THE EQUIPMENT PLATFORM AND VIEWS THE EARTH THROUGH A SPECIAL APERTURE IN THE SPACECRAFT'S SIDE. A SUPPORT STRUCTURE EXTENDS RADIAL OUT FROM THE CENTRAL TUBE AND IS AFFIXED TO THE SOLAR PANELS, WHICH FORM THE OUTER WALLS OF THE SPACECRAFT AND PROVIDE THE PRIMARY SOURCE OF ELECTRICAL POWER. LOCATED IN THE ANNULUS-SHAPED SPACE BETWEEN THE CENTRAL TUBE AND THE SOLAR PANELS ARE STATIONKEEPING AND DYNAMICS CONTROL EQUIPMENT AND BATTERIES. PROPER SPACECRAFT ATTITUDE AND SPIN RATE (APPROXIMATELY 100 RPM) ARE MAINTAINED BY JET THRUSTERS MOUNTED ON THE SPACECRAFT AND ACTIVATED BY GROUND COMMAND. THE SPACECRAFT USES BOTH UHF-BAND AND S-BAND FREQUENCIES IN ITS TELEMETRY AND COMMAND SUBSYSTEMS. A LOW-POWER VHF TRANSPONDER PROVIDES TELEMETRY AND COMMAND DURING LAUNCH AND THEN SERVES AS A BACKUP FOR THE PRIMARY SUBSYSTEM ONCE THE SPACECRAFT HAS ATTAINED SYNCHRONOUS ORBIT.

----- METEOSAT 2, ESA STAFF-----

INVESTIGATION NAME- IMAGING RADIOMETER

ORIGINAL PAGE IS  
OF POOR QUALITY



OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-C, WILLIAMS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- NOAA-C -04	INVESTIGATIVE PROGRAM CODE EB/OPER ENVIRON MONITORING
	INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS	NOAA-ERL
OI - H.H. SAUER	NOAA-ERL
OI - C.C. BOSTROM	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE TIROS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 40 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 25 MEV/N. THERE ARE TWO LEPAT'S VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEWS IN THE ANTI-EARTH DIRECTION, AND MEASURES PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOAA-D \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA-D  
ALTERNATE NAMES-

NSSDC ID- NOAA-D

LAUNCH DATE- 04/15/82 WEIGHT- 588.9 KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-GSTA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	INCLINATION- 98.7 DEG
ORBIT PERIOD- 101.5 MIN	APOAPSIS- 833. KM ALT
PERIAPSIS- 833. KM ALT	

PERSONNEL

MG - M.L. GARBACZ	NASA HEADQUARTERS
PM - G.A. BRANCHFLOWER	NASA-GSFC
PS - A. ARKING	NASA-GSFC

BRIEF DESCRIPTION

NOAA-D IS THE FOURTH IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDES AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDE AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSIST OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH; AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSES AND RELAYS TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE IS BASED UPON THE BLOCK 5D SPACECRAFT BUS DEVELOPED FOR THE US AIR FORCE, AND IS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S.

----- NOAA-D, NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-D -01

INVESTIGATIVE PROGRAM

CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)

METEOROLOGY

PERSONNEL

PI -	NESS STAFF
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NOAA-NESS

BRIEF DESCRIPTION

THE NOAA-D ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) IS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA ARE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATES IN THE SCANNING MODE AND MEASURES EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRONEETERS, CHANNEL 2 (NEAR IR), 0.725 MICRONEETER TO DETECTOR CUTOFF AROUND 1.3 MICRONEETERS, CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRONEETERS, AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.95 MICRONEETERS. ALL FOUR CHANNELS HAVE A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAVE A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR IS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA ARE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD ARE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDE GLOBAL AREA COVERAGE (GAC) DATA, WHICH HAVE A RESOLUTION OF 1 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINS DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS ARE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-D, NESS STAFF -----

INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER

NSSDC ID- NOAA-D -02	INVESTIGATIVE PROGRAM CODE EB/OPERATIONAL WEATHER OBS
	INVESTIGATION DISCIPLINE(S) METEOROLOGY

PERSONNEL

PI -	NESS STAFF
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NOAA-NESS

BRIEF DESCRIPTION

THE NOAA-D OPERATIONAL SOUNDER CONSISTS OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAS 14 CHANNELS AND MAKES MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS: CHANNEL 1 - THE 3.7-MICRONEETER WINDOW REGION, CHANNEL 2 - THE 4.3-MICRONEETER CO<sub>2</sub> BAND, CHANNEL 3 - THE 9.7-MICRONEETER OZONE BAND, CHANNEL 4 - THE 11.1-MICRONEETER WINDOW REGION, CHANNELS 5 THROUGH 11 - THE 15-MICRONEETER CO<sub>2</sub> BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 14 - THE 18-MICRONEETER ROTATIONAL WATER VAPOR BANDS (18.8, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAS THREE CHANNELS OPERATING AT 14.97 MICRONEETERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE-MODULATED CELLS CONTAINING CO<sub>2</sub>. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAS FOUR CHANNELS OPERATING IN THE 50 TO 60 GHZ OXYGEN BAND (50.3, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS ARE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-D, NESS STAFF -----

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-D -03	INVESTIGATIVE PROGRAM CODE EB/OPERATIONAL WEATHER OBS
	INVESTIGATION DISCIPLINE(S) METEOROLOGY

PERSONNEL

PI -	NESS STAFF
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NOAA-NESS

BRIEF DESCRIPTION

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA-D IS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVES LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON

OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-D, WILLIAMS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- NOAA-D -04      INVESTIGATIVE PROGRAM

CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)

PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
OI - W.H. SAUER  
OI - C.J. BOSTROM

NOAA-ERL  
NOAA-ERL  
APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE ITOS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 40 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 25 MEV/N. THERE ARE TWO LEPAT'S VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEWS IN THE ANTI-EARTH DIRECTION, AND MEASURES PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOAA-E \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA-E  
ALTERNATE NAMES-

NSSDC ID- NOAA-E

LAUNCH DATE- 04/15/83      WEIGHT- 588.9 KG

LAUNCH SITE- VANDENBERG AFB, UNITED STATES

LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES      NOAA-NESS  
UNITED STATES      NASA-GSFC

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC

ORBIT PERIOD- 101.5 MIN

PERIAPSIS- 833. KM ALT

INCLINATION- 98.7 DEG  
APOAPSIS- 833. KM ALT

PERSONNEL

MG - M.L. GARBACZ  
PM - G.A. BRANCHFLOWER  
PS - A. ARKING

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

NOAA-E IS THE FIFTH IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDES AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDE AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSIST OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSES AND RELAYS TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE IS BASED UPON THE BLOCK 5D SPACECRAFT BUS DEVELOPED FOR THE US AIR FORCE, AND IS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S.

----- NOAA-E, NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-E -01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE NOAA-E ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) IS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA ARE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATES IN THE SCANNING MODE AND MEASURES EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRONE, CHANNEL 2 (NEAR IR), 0.725 MICRONE TO DETECTOR CUTOFF AROUND 1.3 MICRONE, CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRONE, AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.93 MICRONE. ALL FOUR CHANNELS HAVE A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAVE A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR IS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA ARE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD ARE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDE GLOBAL AREA COVERAGE (GAC) DATA, WHICH HAVE A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINS DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1-KM RESOLUTION. IDENTICAL EXPERIMENTS ARE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-E, NESS STAFF -----

INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER

NSSDC ID- NOAA-E -02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE NOAA-E OPERATIONAL SOUNDER CONSISTS OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAS 14 CHANNELS AND MAKES MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS: CHANNEL 1 - THE 3.7-MICRONE WINDOW REGION; CHANNEL 2 - THE 4.3-MICRONE CO<sub>2</sub> BAND; CHANNEL 3 - THE 9.7-MICRONE OZONE BAND; CHANNEL 4 - THE 11.1-MICRONE WINDOW REGION; CHANNELS 5 THROUGH 11 - THE 15-MICRONE CO<sub>2</sub> BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 16 - THE 16-MICRONE ROTATIONAL WATER VAPOR BANDS (18.8, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAS THREE CHANNELS OPERATING AT 14.97 MICRONES USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE-MODULATED CELLS CONTAINING CO<sub>2</sub>. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAS FOUR CHANNELS OPERATING IN THE 50- TO 60-GHZ OXYGEN BAND (50.5, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS ARE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-E, NESS STAFF -----

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-E -03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA-E IS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVES LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-E, WILLIAMS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- NOAA-E -04      INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
  
INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
OI - M.H. SAUER  
OI - C.O. BOSTROM

NOAA-ERL  
NOAA-ERL  
APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE TIROS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 40 MEV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 25 MEV/N. THERE ARE TWO LEPAT'S VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 150 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEWS IN THE ANTI-EARTH DIRECTION, AND MEASURES PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOAA-F \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA-F  
ALTERNATE NAMES-

NSSDC ID- NOAA-F

LAUNCH DATE- 04/15/84      WEIGHT- 588.9 KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY  
UNITED STATES      NOAA-NESS  
UNITED STATES      NASA-GSFC

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101.5 MIN  
PERIAPSIS- 833. KM ALT      INCLINATION- 98.7 DEG  
APOAPSIS- 833. KM ALT

PERSONNEL  
MG - M.L. GARDALZ  
PM - G.A. BRANCHFLOWER  
PS - A. ARKING      NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
NOAA-F IS THE SIXTH IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDES AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDE AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSIST OF A SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSES AND RELAYS TO CENTRAL DATA ACQUISITION STATIONS THE VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE IS BASED UPON THE BLOCK 5D SPACECRAFT THAT'S DEVELOPED FOR THE US AIR FORCE, AND IS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.035 DEG/S.

----- NOAA-F, BROOME -----

INVESTIGATION NAME- EARTH RADIATION BUDGET INSTRUMENT (ERBI)

NSSDC ID- NOAA-F -05      INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING  
  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
TL - G.C. BROOME  
TM - A.A. RUDMANN      NASA-LARC  
NASA-GSFC

BRIEF DESCRIPTION  
THE EARTH RADIATION BUDGET SATELLITE SYSTEM (ERBSS) IS DESIGNED TO MEASURE THE ENERGY EXCHANGE BETWEEN THE EARTH-ATMOSPHERE SYSTEM AND SPACE. THESE MEASUREMENTS ARE IMPORTANT FOR CLIMATE PREDICTION AND IN DEVELOPING STATISTICAL RELATIONSHIPS BETWEEN REGIONAL WEATHER AND RADIATION BUDGET ANOMALIES. THE EARTH RADIATION BUDGET EXPERIMENTS WILL BE FLOWN ON BOTH NOAA AND ERBS SATELLITES TO MEASURE REGIONAL

RADIATION BUDGETS AND EQUATOR-TO-POLE GRADIENTS OF NET RADIATION. THE EARTH RADIATION BUDGET INSTRUMENT (ERBI) CONSISTS OF EIGHT CHANNELS DISTRIBUTED WITHIN TWO INSTRUMENT PACKAGES: THE WIDE AND MEDIUM FIELD OF VIEW INSTRUMENT (W/MFOV) AND THE SCANNER INSTRUMENT. THE W/MFOV IS A FIVE CHANNEL RADIOMETER. FOUR CHANNELS ARE PRIMARILY EARTH-VIEWING, BUT UPON COMMAND CAN BE POINTED TOWARD THE SUN FOR PERIODIC CALIBRATION. THE FIFTH CHANNEL IS FIXED FOR CONTINUOUS OBSERVATION OF THE SUN FOR CALIBRATION. TWO OF THE FOUR GIMBALED SENSORS ARE WIDE-ANGLED AND VIEW THE ENTIRE EARTH FROM LIMB TO LIMB, APPROXIMATELY 177 DEG FOR TIROS-N AND 135 DEG FOR ERBS-A. THESE DETECTORS HAVE BROADBAND SPECTRAL RESPONSES VARYING FROM 0.2 MICRUMETERS TO OVER 50 MICRUMETERS. CHANNEL 1 MAKES TOTAL RADIATION MEASUREMENTS WHILE CHANNEL 2, WITH ITS FILTER ATTACHED, MAKES MEASUREMENTS OVER THE SHORTWAVE SPECTRAL BAND CHARACTERIZED BY THE SUPRASIL-1 DOME FILTER WHICH CUTS OFF AT 5 MICRUMETERS. THE REMAINING TWO GIMBALED SENSORS ARE MEDIUM FIELD OF VIEW CHANNELS WITH A 66-DEG FIELD OF VIEW FOR TIROS-N AND 88 DEG FOR ERBS-A, EQUIVALENT TO A TERAS-SIZE FOOTPRINT. CHANNEL 3 MEASURES TOTAL RADIATION WHILE CHANNEL 4, PLACED UNDER A SUPRASIL-1 DOME, MEASURES THE SHORTWAVE SPECTRAL BAND. THE EARTH-EMITTED LONGWAVE RADIATION COMPONENT IS DETERMINED BY SUBTRACTING THE SHORTWAVE CHANNEL FROM THE TOTAL CHANNEL. THE SOLAR CHANNEL (5) HAS A 10 DEG FIELD OF VIEW MEASURING THE TOTAL SOLAR SPECTRAL RANGE OF THE SUN. THE SCANNER INSTRUMENT IS A SMALL SPATIAL RESOLUTION (FOV EQUALS 3 DEG DIAMETER) SCANNING RADIOMETER CONTAINING THREE SEPARATE CHANNELS (6,7,8). CHANNEL 6 ISOLATES THE SHORTWAVE SPECTRAL INTERVAL (0.22 TO 5 MICRUMETERS). CHANNEL 7 MEASURES THE LONGWAVE SPECTRAL REGION (5 TO 50 MICRUMETERS), AND CHANNEL 8 (1.6 MICRUMETERS) PROVIDES CLOUD IMAGERY TO AID IN ANALYZING CHANNEL 6 AND 7 DATA. ALL THREE SENSORS ARE LOCATED WITHIN A CONTINUOUSLY ROTATING SCAN DRUM WHICH SCANS THE FOV ACROSS TRACK SEQUENTIALLY FROM HORIZON TO HORIZON AND FROM A SPACE VIEW FOR CALIBRATION. ADDITIONAL INFORMATION CAN BE OBTAINED FROM 'SYSTEM CONSIDERATIONS FOR AN EARTH RADIATION BUDGET SCANNING RADIOMETER,' AND 'THE EARTH RADIATION BUDGET SATELLITE SYSTEM OF THE EARLY 1980'S.'

----- NOAA-F, NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER  
(AVHRR)

NSSDC ID- NOAA-F -01      INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF      NOAA-NESS

BRIEF DESCRIPTION  
THE NOAA-F ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) IS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA ARE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATES IN THE SCANNING MODE AND MEASURES EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRUMETER, CHANNEL 2 (NEAR IR), 0.725 MICRUMETER TO DETECTOR CUTOFF AROUND 1.1 MICRUMETERS, CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRUMETERS, AND CHANNEL 4 (IR WINDOW), 3.95 TO 3.95 MICRUMETERS. ALL FOUR CHANNELS HAVE A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAVE A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR IS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA ARE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD ARE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDE GLOBAL AREA COVERAGE (GAC) DATA, WHICH HAVE A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH CONTAINS DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS ARE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-F, NESS STAFF -----

INVESTIGATION NAME- OPERATIONAL VERTICAL SOUNDER

NSSDC ID- NOAA-F -02      INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL  
PI - NESS STAFF      NOAA-NESS

BRIEF DESCRIPTION  
THE NOAA-F OPERATIONAL SOUNDER CONSISTS OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAS 14 CHANNELS AND MAKES MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 - THE 3.7-MICRUMETER WINDOW REGION, CHANNEL 2 - THE 4.3-MICRUMETER CO<sub>2</sub> BAND, CHANNEL 3 - THE 9.7-MICRUMETER OZONE BAND, CHANNEL 4 - THE 11.1-MICRUMETER WINDOW REGION, CHANNELS 5 THROUGH 11 - THE 15-MICRUMETER CO<sub>2</sub> BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 14 - THE

ORIGINAL PAGE IS  
OF POOR QUALITY

18-MICRUMETER ROTATIONAL WATER VAPOR BANDS (18.0, 23.19, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAS THREE CHANNELS OPERATING AT 14.97 MICRUMETERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE MODULATED CELLS CONTAINING CO<sub>2</sub>. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAS FOUR CHANNELS OPERATING IN THE 50- TO 60-GHZ OXYGEN BAND (50.3, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS ARE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-F, NESS STAFF -----

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-F -03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

PI - NESS STAFF

NOAA-NESS

BRIEF DESCRIPTION

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA-F IS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVES LOW DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-F, WILLIAMS -----

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR

NSSDC ID- NOAA-F -04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS  
DI - H.H. SAUER  
OI - C.O. BOSTROM

NOAA-ERL  
NOAA-ERL  
APPLIED PHYSICS LAB

BRIEF DESCRIPTION

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE ITOS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND DATA PROCESSING UNIT. THE LOW-ENERGY PROTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV AND 40 REV AND ALPHA PARTICLES BETWEEN 150 KEV/N AND 29 MEV/N. THERE ARE TWO LEPAT'S VIEWING IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PROTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 100 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PROTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEWS IN THE ANTI-EARTH DIRECTION, AND MEASURES PROTONS ABOVE 400 MEV AND PROTONS AND ALPHA PARTICLES ABOVE 600 AND 1000 MEV/N. THE TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOAA-G \*\*\*\*\*

SPACECRAFT COMMON NAME- NOAA-G  
ALTERNATE NAMES-

NSSDC ID- NOAA-G

LAUNCH DATE- 04/15/85 WEIGHT- 588.9 KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES NOAA-NESS  
UNITED STATES NASA-OSTA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 101.5 MIN  
PERIAPSIS- 833. KM ALT

INCLINATION- 98.7 DEG  
APOAPSIS- 833. KM ALT

PERSONNEL

NG - M.L. GARBACE  
PH - U.A. BRANCHFLOWER  
PS - A. ARKING

NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

NOAA-G IS THE SEVENTH IN A SERIES OF THIRD-GENERATION, OPERATIONAL METEOROLOGICAL SATELLITES FOR USE IN THE NATIONAL OPERATIONAL ENVIRONMENTAL SATELLITE SUBSYSTEM (NOESS) TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) DURING 1978-84. THE SATELLITE DESIGN PROVIDES AN ECONOMICAL AND STABLE SUN-SYNCHRONOUS PLATFORM FOR ADVANCED OPERATIONAL INSTRUMENTS TO MEASURE THE EARTH'S ATMOSPHERE, ITS SURFACE AND CLOUD COVER, AND THE NEAR-SPACE ENVIRONMENT. PRIMARY SENSORS INCLUDE AN ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) FOR OBSERVING DAYTIME AND NIGHTTIME GLOBAL CLOUD COVER AND AN OPERATIONAL VERTICAL SOUNDER FOR OBTAINING TEMPERATURE AND WATER VAPOR PROFILES THROUGH THE EARTH'S ATMOSPHERE. SECONDARY EXPERIMENTS CONSIST OF AN SPACE ENVIRONMENT MONITOR (SEM), WHICH MEASURES THE PROTON AND ELECTRON FLUX NEAR THE EARTH, AND A DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS), WHICH PROCESSES AND RELAYS TO CENTRAL DATA ACQUISITION STATIONS. VARIOUS METEOROLOGICAL DATA RECEIVED FROM FREE-FLOATING BALLOONS AND OCEAN BUOYS DISTRIBUTED AROUND THE GLOBE. THE SATELLITE IS BASED UPON THE BLOCK 3D SPACECRAFT BUS DEVELOPED FOR THE US AIR FORCE, AND IS CAPABLE OF MAINTAINING AN EARTH-POINTING ACCURACY OF BETTER THAN PLUS OR MINUS 0.1 DEG WITH A MOTION RATE OF LESS THAN 0.025 DEG/SEC.

----- NOAA-G, BROOME -----

INVESTIGATION NAME- EARTH RADIATION BUDGET INSTRUMENT (ERBI)

NSSDC ID- NOAA-G -05

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORING

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

PERSONNEL

TL - G.C. BROOME  
TH - A.A. RUDMANN

NASA-LARC  
NASA-GSFC

BRIEF DESCRIPTION

THE EARTH RADIATION BUDGET SATELLITE SYSTEM (ERBSS) IS DESIGNED TO MEASURE THE ENERGY EXCHANGE BETWEEN THE EARTH-ATMOSPHERE SYSTEM AND SPACE. THESE MEASUREMENTS ARE IMPORTANT FOR CLIMATE PREDICTION AND IN DEVELOPING STATISTICAL RELATIONSHIPS BETWEEN REGIONAL WEATHER AND RADIATION BUDGET ANOMALIES. THE EARTH RADIATION BUDGET EXPERIMENTS WILL BE FLOWN ON BOTH NOAA AND ERBS SATELLITES TO MEASURE REGIONAL RADIATION BUDGETS AND EQUATOR-TO-POLE GRADIENTS OF NET RADIATION. THE EARTH RADIATION BUDGET INSTRUMENT (ERBI) CONSISTS OF EIGHT CHANNELS DISTRIBUTED WITHIN TWO INSTRUMENT PACKAGES: THE WIDE AND MEDIUM FIELD OF VIEW INSTRUMENT (W/MFOV) AND THE SCANNER INSTRUMENT. THE W/MFOV IS A FIVE CHANNEL RADIOMETER. FOUR CHANNELS ARE PRIMARILY EARTH-VIEWING, BUT UPON COMMAND CAN BE POINTED TOWARD THE SUN FOR PERIODIC CALIBRATION. THE FIFTH CHANNEL IS FIXED FOR CONTINUOUS OBSERVATION OF THE SUN FOR CALIBRATION. TWO OF THE FOUR GIMBALED SENSORS ARE WIDE-ANGLED AND VIEW THE ENTIRE EARTH FROM LIMB TO LIMB, APPROXIMATELY 177 DEG FOR TIROS-N AND 135 DEG FOR ERBS-A. THESE DETECTORS HAVE BROADBAND SPECTRAL RESPONSES VARYING FROM 0.2 MICRUMETERS TO OVER 50 MICRUMETERS. CHANNEL 1 MAKES TOTAL RADIATION MEASUREMENTS WHILE CHANNEL 2, WITH ITS FILTER ATTACHED, MAKES MEASUREMENTS OVER THE SHORTWAVE SPECTRAL BAND CHARACTERIZED BY THE SUPRASIL-W DOME FILTER WHICH CUTS OFF AT 5 MICRUMETERS. THE REMAINING TWO GIMBALED SENSORS ARE MEDIUM FIELD OF VIEW CHANNELS WITH A 66-DEG FIELD OF VIEW FOR TIROS-N AND 88 DEG FOR ERBS-A, EQUIVALENT TO A TEXAS-SIZE FOOTPRINT. CHANNEL 3 MEASURES TOTAL RADIATION WHILE CHANNEL 4, PLACED UNDER A SUPRASIL-W DOME, MEASURES THE SHORTWAVE SPECTRAL BAND. THE EARTH-EMITTED LONGWAVE RADIATION COMPONENT IS DETERMINED BY SUBTRACTING THE SHORTWAVE CHANNEL FROM THE TOTAL CHANNEL. THE SOLAR CHANNEL (5) HAS A 10-DEG FIELD OF VIEW MEASURING THE TOTAL SOLAR SPECTRAL RANGE OF THE SUN. THE SCANNER INSTRUMENT IS A SMALL SPATIAL RESOLUTION (FOV EQUALS 3 DEG DIAMETER) SCANNING RADIOMETER CONTAINING THREE SEPARATE CHANNELS, (6.7-8.8). CHANNEL 6 ISOLATES THE SHORTWAVE SPECTRAL INTERVAL (0.2 TO 5 MICRUMETERS). CHANNEL 7 MEASURES THE LONGWAVE SPECTRAL REGION (5 TO 50 MICRUMETERS), AND CHANNEL 8 (1.6 MICRUMETERS) PROVIDES CLOUD IMAGERY TO AID IN ANALYZING CHANNEL 6 AND 7 DATA. ALL THREE SENSORS ARE LOCATED WITHIN A CONTINUOUSLY ROTATING SCAN DRUM WHICH SCANS THE FOV ACROSS TRACK SEQUENTIALLY FROM HORIZON TO HORIZON AND FROM A SPACE VIEW FOR CALIBRATION. ADDITIONAL INFORMATION CAN BE OBTAINED FROM 'SYSTEM CONSIDERATIONS FOR AN EARTH RADIATION BUDGET SCANNING RADIOMETER,' AND 'THE EARTH RADIATION BUDGET SATELLITE SYSTEM OF THE EARLY 1980'S.'

----- NOAA-G, NESS STAFF -----

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-G -01

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY

**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE NOAA-G ADVANCED VERT HIGH RESOLUTION RADIOMETER (AVHRR) IS A FOUR-CHANNEL SCANNING RADIOMETER CAPABLE OF PROVIDING GLOBAL DAYTIME AND NIGHTTIME SEA SURFACE TEMPERATURE, ICE, SNOW, AND CLOUD INFORMATION. THESE DATA ARE OBTAINED ON A DAILY BASIS FOR USE IN WEATHER ANALYSIS AND FORECASTING. THE MULTISPECTRAL RADIOMETER OPERATES IN THE SCANNING MODE AND MEASURES EMITTED AND REFLECTED RADIATION IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 (VISIBLE), 0.55 TO 0.9 MICRONESTER, CHANNEL 2 (NEAR IR), 0.725 MICRONESTER TO DETECTOR CUTOFF AROUND 1.3 MICRONESTER, CHANNEL 3 (IR WINDOW), 10.5 TO 11.5 MICRONESTER, AND CHANNEL 4 (IR WINDOW), 3.55 TO 3.95 MICRONESTER. ALL FOUR CHANNELS HAVE A SPATIAL RESOLUTION OF 1.1 KM, AND THE TWO IR WINDOW CHANNELS HAVE A THERMAL RESOLUTION OF 0.12 DEG K AT 300 DEG K. THE AVHRR IS CAPABLE OF OPERATING IN BOTH REAL-TIME OR RECORDED MODES. REAL-TIME OR DIRECT READOUT DATA ARE TRANSMITTED TO GROUND STATIONS BOTH AT LOW (4 KM) RESOLUTION VIA AUTOMATIC PICTURE TRANSMISSION (APT) AND AT HIGH (1 KM) RESOLUTION VIA HIGH RESOLUTION PICTURE TRANSMISSION (HRPT). DATA RECORDED ON BOARD ARE AVAILABLE FOR CENTRAL PROCESSING. THEY INCLUDE GLOBAL AREA COVERAGE (GAC) DATA, HAVE A RESOLUTION OF 4 KM, AND LOCAL AREA COVERAGE (LAC) DATA, WHICH WILL CONTAIN DATA FROM SELECTED PORTIONS OF EACH ORBIT WITH A 1 KM RESOLUTION. IDENTICAL EXPERIMENTS ARE FLOWN ON THE OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-G, NESS STAFF -----

**INVESTIGATION NAME** - OPERATIONAL VERTICAL SOUNDER

NSSDC ID- NOAA-G -02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBSINVESTIGATION DISCIPLINE(S)  
METEOROLOGY**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE NOAA-G OPERATIONAL SOUNDER CONSISTS OF THREE INSTRUMENTS DESIGNED TO DETERMINE RADIANCES NEEDED TO CALCULATE TEMPERATURE AND HUMIDITY PROFILES OF THE ATMOSPHERE FROM THE SURFACE TO THE STRATOSPHERE (APPROXIMATELY 1 MB). THE FIRST INSTRUMENT, THE BASIC SOUNDING UNIT (BSU), HAS 14 CHANNELS AND MAKES MEASUREMENTS IN THE FOLLOWING SPECTRAL INTERVALS -- CHANNEL 1 - THE 3.7 MICRONESTER WINDOW REGION, CHANNEL 2 - THE 4.3 MICRONESTER CARBON DIOXIDE BAND, CHANNEL 3 - THE 9.7 MICRONESTER OZONE BAND, CHANNEL 4 - THE 11.1 MICRONESTER WINDOW REGION, CHANNELS 5 THROUGH 11 - THE 15 MICRONESTER CARBON DIOXIDE BAND (13.3, 13.6, 14.0, 14.3, 14.5, 14.75, AND 15.0), AND CHANNELS 12 THROUGH 14 - THE 18 TO 35 MICRONESTER ROTATIONAL WATER VAPOR BANDS (18.8, 23.15, AND 29.4). THE SECOND INSTRUMENT, THE STRATOSPHERIC SOUNDING UNIT, HAS THREE CHANNELS OPERATING AT 14.97 MICRONESTERS USING SELECTIVE ABSORPTION BY PASSING THE INCOMING RADIATION THROUGH THREE PRESSURE-MODULATED CELLS CONTAINING CARBON DIOXIDE. THE THIRD INSTRUMENT, THE MICROWAVE SOUNDING UNIT, HAS FIVE CHANNELS OPERATING IN THE 50 TO 60 GHZ OXYGEN BAND (50.3, 53.7, 55.0, AND 57.9) TO OBTAIN TEMPERATURE PROFILES WHICH ARE FREE OF CLOUD INTERFERENCE. THE INSTRUMENTS ARE CROSS-COURSE SCANNING DEVICES UTILIZING A STEP SCAN TO PROVIDE A TRAVERSE SCAN WHILE THE ORBITAL MOTION OF THE SATELLITE PROVIDES SCANNING IN THE ORTHOGONAL DIRECTION. SIMILAR EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-G, NESS STAFF -----

**INVESTIGATION NAME** - DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-G -03

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBSINVESTIGATION DISCIPLINE(S)  
METEOROLOGY**PERSONNEL**

PI - NESS STAFF

NOAA-NESS

**BRIEF DESCRIPTION**

THE DATA COLLECTION AND PLATFORM LOCATION SYSTEM (DCS) ON NOAA-G IS DESIGNED TO MEET THE METEOROLOGICAL DATA NEEDS OF THE UNITED STATES AND TO SUPPORT THE GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP). THE SYSTEM RECEIVES LOW-DUTY CYCLE TRANSMISSIONS OF METEOROLOGICAL OBSERVATIONS FROM FREE-FLOATING BALLOONS, OCEAN BUOYS, OTHER SATELLITES, AND FIXED GROUND-BASED SENSOR PLATFORMS DISTRIBUTED AROUND THE GLOBE. THESE OBSERVATIONS ARE ORGANIZED ON BOARD THE SPACECRAFT AND RETRANSMITTED WHEN THE SPACECRAFT COMES IN RANGE OF A COMMAND AND DATA ACQUISITION (CDA) STATION. FOR FREE-MOVING BALLOONS, THE DOPPLER FREQUENCY SHIFT OF THE TRANSMITTED SIGNAL IS OBSERVED TO CALCULATE THE LOCATION OF THE BALLOONS. THE DCS IS EXPECTED, FOR A MOVING SENSOR PLATFORM, TO HAVE A LOCATION ACCURACY OF 5 TO 8 KM RMS, AND A VELOCITY ACCURACY OF 1 TO 1.6 M/S. THIS SYSTEM HAS THE CAPABILITY OF ACQUIRING DATA FROM UP TO 2000 PLATFORMS PER DAY. IDENTICAL EXPERIMENTS ARE FLOWN ON OTHER SPACECRAFT IN THE TIROS-N/NOAA SERIES.

----- NOAA-E, WILLIAMS -----

**INVESTIGATION NAME** - SPACE ENVIRONMENT MONITOR

NSSDC ID- NOAA-E -04

INVESTIGATIVE PROGRAM  
CODE EB/OPER ENVIRON MONITORINGINVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS**PERSONNEL**

PI - D.J. WILLIAMS

OI - M.H. SAUER

OI - C.O. BOISTRUP

NOAA-ERL

NOAA-ERL

APPLIED PHYSICS LAB

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS AN EXTENSION OF THE SOLAR PROTON MONITORING EXPERIMENT FLOWN ON THE ITOS SPACECRAFT SERIES. THE EXPERIMENT PACKAGE CONSISTS OF FOUR DETECTOR SYSTEMS AND A DATA PROCESSING UNIT. THE LOW-ENERGY PHOTON ALPHA TELESCOPE (LEPAT) SEPARATELY MEASURES IN FIVE ENERGY RANGES BOTH PROTONS BETWEEN 150 KEV/N AND 25 MEV/N. THERE ARE TWO LEPA TS VIEWS IN THE ANTI-SUN AND ANTI-EARTH DIRECTIONS WITH 60-DEG VIEWING CONES. THE PHOTON OMNIDIRECTIONAL DETECTOR (POD) MEASURES PROTONS ABOVE 10, 30, AND 60 MEV, ELECTRONS ABOVE 140 KEV, AND PROTONS AND ELECTRONS (INSEPARABLE) ABOVE 750 KEV. THE HIGH-ENERGY PHOTON ALPHA TELESCOPE (HEPAT) HAS A 50-DEG VIEWING CONE, VIEWS IN THE ANTI-EARTH DIRECTION, AND MEASURES PROTONS ABOVE 400 MEV AND TOTAL ENERGY DETECTOR (TED) MEASURES TOTAL ENERGY ABOVE 1 KEV.

\*\*\*\*\* NOSS \*\*\*\*\*

SPACECRAFT COMMON NAME - NOSS  
ALTERNATE NAMES - NAT'L OCEANIC SATELLITE

NSSDC ID- NOSS

LAUNCH DATE- 00/00/06  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- SHUTTLESPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-CAPLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 98.7 MIN  
PERIAPSIS- 700. KM ALT INCLINATION- 89. DEG  
APOAPSIS- 700. KM ALTPERSONNEL  
PM - G.A. BRANCHFLOWER NASA-GSFC

**BRIEF DESCRIPTION**  
THE NATIONAL OCEANIC SATELLITE SYSTEM (NOSS) IS A JOINT ENDEAVOR, FUNDED BY NASA, NOAA, AND DOD. THE NOSS WILL BE A LIMITED, REAL-TIME, OPERATIONAL DEMONSTRATION FOR CONTINUOUS OBSERVATIONS OF THE OCEAN'S SURFACE WINDS, SEA-STATE, SURFACE WATER TEMPERATURE, WAVE HEIGHT, ICE, AND OTHER GEOPHYSICAL MEASUREMENTS UNDER ALL WEATHER CONDITIONS. THE BASIC INSTRUMENT COMPLIMENT FOR THE SATELLITE CONSISTS OF THREE PREVIOUSLY FLOWN INSTRUMENTS (AN IMPROVED VERSION OF THE NIMBUS-7 COASTAL ZONE COLOR SCANNER (CZCS/2), THE SEASAT-A RADAR ALTIMETER (ALT), AND AN IMPROVED VERSION OF THE SEASAT-A SCATTEROMETER (SCAT/2); AND ONE NOW IN DEVELOPMENT, THE LARGE ANTENNA MULTICHANNEL MICROWAVE RADIOMETER (LARMR). THE NOSS SATELLITE WILL BE LAUNCHED BY THE SPACE SHUTTLE INTO A 300-KM INTERMEDIATE ORBIT. THE SPACECRAFT BUS PROVIDES THE PROPULSION CAPABILITY TO ATTAIN THE MISSION'S REQUIRED SUN-SYNCHRONOUS ORBITS OF 600 TO 900 KM, AND TO RETURN TO SHUTTLE ORBIT ALTITUDE ON COMMAND. THE DESIGN DURATION OF THE OPERATIONAL DEMONSTRATION IS 5 YEARS.

----- NOSS, BEBRIS -----

**INVESTIGATION NAME** - MICROWAVE WIND SCATTEROMETER (SCAT/2)

NSSDC ID- NOSS -02

INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGYPERSONNEL  
TL - J. BEBRIS NASA-GSFC

**BRIEF DESCRIPTION**  
THE NOSS SCATTEROMETER (SCAT/2) IS AN ACTIVE MICROWAVE SENSOR EMPLOYED TO DETERMINE OCEAN SURFACE WINDFIELD VELOCITY AND DIRECTION IN BROAD SWATHS ON EITHER SIDE OF THE SATELLITE SUBTRACK. THE SCAT/2 DESIGN CONCEPTS AND PERFORMANCE PARAMETERS ARE BASED ON THOSE OF THE WIND SCATTEROMETER SUCCESSFULLY DEMONSTRATED ON SEASAT-A, AND DERIVED FROM EARLIER SATELLITE AND AIRCRAFT EXPERIMENTS. THE SCAT/2 IS A LONG PULSE, DOPPLER-SCANNED, MONOSTATIC RADAR WHICH MAKES MEASUREMENTS OF THE OCEAN-SURFACE BACKSCATTER COEFFICIENT AT ANGLES RANGING FROM 0 TO 60 DEG ON BOTH SIDES OF THE SATELLITE SUBTRACK. THREE FAR BEAM ANTENNAS ON EACH SIDE OF THE SPACECRAFT ARE USED TO MAKE THREE INDEPENDENT AND TIME-SEPARATED MEASUREMENTS OF THE BACKSCATTER COEFFICIENT IN 10-KM RESOLUTION CELLS AT A 10-KM GRID SPACING THROUGHOUT THE

INSTRUMENT MEASUREMENTS SWATHS. INSTRUMENT BACKSCATTER DATA ARE USEFUL FOR WINDFIELD ESTIMATION PURPOSES IN MEASUREMENT SWATHS CORRESPONDING TO INCIDENCE ANGLES BETWEEN 15 AND 60 DEG. THUS THE SCAT/2 PROVIDES WIND VECTOR DATA IN COVERAGE SWATHS SOME 450 KM IN WIDTH OFFSET ON EITHER SIDE OF THE SATELLITE SUBTRACK. BACKSCATTER MEASUREMENTS AT INCIDENCE ANGLES LESS THAN 15 DEG ARE USEFUL FOR ESTIMATING WIND SPEED AND ALSO AID IN INSTRUMENT CALIBRATION AND SELF-DIAGNOSTICS. THE INSTRUMENT FIELDS-OF-VIEW COVERAGE BELOW 15 DEG IS TERMED THE NEAR-NADIR SWATH AND EXTENDS SOME 100 KM ON EITHER SIDE OF THE SATELLITE SUBTRACK. THE MEASUREMENTS PRECISION AND WIND VECTOR CELL RESOLUTION CAPABILITY OF THE SCAT/2 SYSTEM ARE SIMILAR TO THOSE OF THE SEASAT SCATTEROMETER. HOWEVER, DUE TO THE USE OF TWO ADDITIONAL FAN BEAM ANTENNAS AND MORE SOPHISTICATED ON-BOARD ELECTRONICS FOR RECEIVED SIGNAL PROCESSING AND DETECTION, THE NOSS INSTRUMENT WILL PROVIDE A MUCH MORE EXTENSIVE WIND VECTOR DATA BASE IN DUAL MEASUREMENT SWATHS WITH A MUCH HIGHER PROBABILITY OF SUCCESSFUL WIND DIRECTION ALIAS REMOVAL IN DATA PROCESSING THAN WAS POSSIBLE WITH THE SEASAT INSTRUMENT CONFIGURATION.

----- NOSS, PAROBY -----

INVESTIGATION NAME- COMPRESSED PULSE RADAR ALTIMETER (ALT)

NSSDC ID- NOSS -03 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
OCEANOGRAPHY

PERSONNEL  
TL - P.J. HEFFERNAN NASA-GSFC

BRIEF DESCRIPTION

THE NOSS ALTIMETER (ALT) IS AN ACTIVE MICROWAVE SENSOR WHICH WILL BE USED TO DETERMINE OCEAN WAVE HEIGHTS, SURFACE CURRENTS, WIND VELOCITY, SEA ICE BOUNDARIES, AND OTHER GEOPHYSICAL PARAMETERS IN A NARROW SWATH ALONG THE SATELLITE SUBTRACK. THE ALT IS A THIRD-GENERATION INSTRUMENT AND IS CLOSELY RELATED TO THE RADAR ALTIMETERS SUCCESSFULLY FLOWN ON THE GOES-C AND SEASAT-A MISSIONS. WHILE THE NOSS ALT HAS ESSENTIALLY THE SAME PERFORMANCE PARAMETERS AS THE UNIT FLOWN ON THE PROOF-OF-CONCEPT SEASAT MISSION, IT INCORPORATES A NUMBER OF MODIFICATIONS AND IMPROVEMENTS WHICH SIGNIFICANTLY ENHANCE MISSION OPERATIONS AND RELIABILITY ASPECTS FOR A 3-YEAR MINIMUM PRE-OPERATIONAL DEMONSTRATION. THESE ARE REPROGRAMMABLE ON-BOARD MICROPROCESSORS; ADDITION OF RAINS; INCREASED INSTRUMENT DATA RATE TO PROVIDE ADDITIONAL WAVEFORM SAMPLES; AND IMPROVED INSTRUMENT SELF-CALIBRATION. EACH NOSS SPACECRAFT WILL CARRY TWO ALT INSTRUMENT FOR RELIABILITY; THE INSTRUMENTS WILL BE OPERABLE SIMULTANEOUSLY FOR CROSS-CALIBRATION PURPOSES. THE ALT IS A FIXED-BEAM, NADIR-VIEWING MONOSTATIC CHIRP RADAR WHICH PROVIDES A RANGE MEASUREMENT PRECISION OF 10 CM OR BETTER WITH A SURFACE RESOLUTION OF LESS THAN 10 KM ALONG THE SATELLITE SUBTRACK. THE ALT OPERATES OUT 13.56 GHZ, AND CONSISTS OF THE FOLLOWING MAJOR ELEMENTS: 1.0 M PARABOLIC REFLECTORS; MICROPROCESSOR-CONTROLLED ADAPTIVE TRACKER UNIT (CATU) AND SYNCHRONIZATION AND CONTROL UNIT (SACU); ANALOG AND DIGITAL SIGNAL PROCESSING SUBSYSTEMS AND POWER AND SIGNAL CONDITIONING UNITS. THE ALT TRANSMITS EXTREMELY SHORT CHIRPED PULSES AT A POWER LEVEL OF 2 KW AND A REPETITION RATE OF 1020 PER SECOND. RETURN SIGNALS ARE PROCESSED AND ANALYZED AS TO TIME OF ARRIVAL AND DETAILS SIGNAL STRENGTH AND WAVEFORM SIGNATURE. SERIES OF SUCCESSIVE RETURNS ARE AVERAGED TO YIELD TWENTY-PER-SECOND SMOOTHED DATA ALONG THE SATELLITE SUBTRACK.

----- NOSS, MUNDY, JR. -----

INVESTIGATION NAME- LARGE ANTENNA MULTICHANNEL MICROWAVE RADIOMETER (LAMMR)

NSSDC ID- NOSS -04 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
  
INVESTIGATION DISCIPLINE(S)  
OCEANOGRAPHY  
METEOROLOGY

PERSONNEL  
TL - E.C. MUNDY, JR. NASA-GSFC

BRIEF DESCRIPTION

THE LARGE ANTENNA MULTICHANNEL MICROWAVE RADIOMETER (LAMMR) IS A LARGER VERSION OF THE NINBUS 7 SMRR. THE LAMMR IS A 14-CHANNEL (SEVEN FREQUENCY, DUAL POLARIZED) SCANNING RADIOMETER MEASURING MICROWAVE EMISSIONS BETWEEN 4.3 AND 36.5 GHZ. THE WIDE TRACK NECESSARY TO ACHIEVE GLOBAL COVERAGE IS ACCOMPLISHED WITH A CONICAL BEAM SCAN IN WHICH THE INCIDENT BEAM MAKES AN ANGLE OF 50 DEG TO THE LOCAL VERTICAL. GROUND RESOLUTION REQUIREMENTS DICTATE THAT THE EFFECTIVE ANTENNA APERTURE BE 3.6 TO 4 M. PRIMARY USAGE OF THE LAMMR IS MONITORING THE SEA SURFACE TEMPERATURE, WIND SPEED, AND SEA ICE, AND PROVIDING ATMOSPHERIC CORRECTIONS FOR THE ON-BOARD ALTIMETER (ALT) AND SCATTEROMETER (SCAT/2).

----- NOSS, PAROBY -----

INVESTIGATION NAME- COASTAL ZONE COLOR SCANNER/2 (CZCS/2)

NSSDC ID- NOSS -01 INVESTIGATIVE PROGRAM  
CODE EB/OPERATIONAL WEATHER OBS  
  
INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL  
TL - W. PAROBY NASA-GSFC

BRIEF DESCRIPTION

THE COASTAL ZONE COLOR SCANNER (CZCS/2) IS THE SAME AS ONE FLOWN ON NINBUS-7 WITH THREE ADDITIONAL CHANNELS AND WILL MONITOR CHLOROPHYLL CONCENTRATION AND WATER TURBIDITY DISTRIBUTIONS. THE MULTI-SPECTRAL IMAGING COASTAL ZONE COLOR SCANNER IS AN EARTH-SCANNING NINE-CHANNEL RADIOMETER USING A CLASSICAL CASSEGRAINIAN TELESCOPE AND A WADSWORTH-TYPE GRATING SPECTROMETER. ALL NINE DETECTORS OBSERVE THE SAME AREA ON THE EARTH'S SURFACE AT THE SAME TIME AND DIFFER ONLY IN THE SPECTRAL RANGE THAT THEY DETECT. THE CZCS OPTICAL SYSTEM SEPARATES THE SCAN SCENES INTO TWO SPECTRAL RANGES, THE VISIBLE (INCLUDING SOLAR INFRARED) AND THE THERMAL INFRARED, BY A DICROIC BEAM SPLITTER. THE VISIBLE LIGHT IS DEPOLARIZED AND THEN DISPERSED BY THE DIFFRACTION GRATING. EACH OF THE EIGHT WAVELENGTHS OR COLORS IS SENSED BY A SEPARATE SILICON PHOTODIODE DETECTOR. CO-REGISTRATION OF THE DETECTORS IS ASSURED BY THE USE OF A SINGLE, COMMON FIELD STOP PRIOR TO THE SPECTROMETER. THE INFRARED RADIANCE IS DIRECTED TO A PHOTOCONDUCTOR DETECTOR MOUNTED TO THE INNER STAGE OF A RADIATIVE COOLER. A CONTINUOUSLY ROTATING MIRROR SCANS A NOMINAL 1.12-MRAD (0.065 DEG) INSTANTANEOUS FIELD-OF-VIEW (FOV) ACROSS THE EARTH'S SURFACE PERPENDICULAR TO THE ORBIT TRACT AT 8.52 REVOLUTIONS PER SECOND. THE SPACECRAFT'S ORBITAL VELOCITY PROVIDES THE OTHER DIRECTION. AT THE ORBITAL ALTITUDE OF 700 KM, THIS RESULTS IN AN INSTANTANEOUS SCAN ANGLE OF 39.36 DEG ON EITHER SIDE OF NADIR PRODUCES A SCAN WIDTH ON THE GROUND OF 1148 KM. THE ROTATION OF THE EARTH UNDER THE SPACECRAFT ALLOWS FOR TOTAL SURFACE COVERAGE IN THE TEMPERATE AND POLAR ZONES AND APPROXIMATELY 80 PERCENT COVERAGE IN THE TROPICS EVERY DAY.

\*\*\*\*\* OSS-1 \*\*\*\*\*

SPACECRAFT COMMON NAME- OSS-1  
ALTERNATE NAMES- SHUTTLE OFT-4

NSSDC ID- SHOT-4

LAUNCH DATE- 04/00/82 WEIGHT- 3730. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-OSS

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 90. MIN  
PERIAPSIS- 300. KM ALT  
INCLINATION- 40.3 DEG  
APOAPSIS- 300. KM ALT

PERSONNEL  
MM - K. KISSIN NASA-GSFC  
MS - W.M. HEUPERT NASA-GSFC

BRIEF DESCRIPTION

THE EXPERIMENTS SELECTED TO BE PART OF THE OSS-1 PAYLOAD HAVE SEVERAL OBJECTIVES WHICH INCLUDE THE FOLLOWING: TO CONDUCT SUPPLEMENTARY OBSERVATIONS OF THE ORBITER'S ENVIRONMENT THAT HAVE SPECIFIC APPLICABILITY TO PLASMA PHYSICS AND ASTRONOMICAL PAYLOADS; TO CONDUCT SCIENTIFIC OBSERVATIONS THAT DEMONSTRATE THE SPACE SHUTTLE'S RESEARCH CAPABILITIES AND ARE APPROPRIATE FOR FLIGHT ON AN EARLY MISSION; AND TO EVALUATE TECHNOLOGY THAT MAY HAVE APPLICATION IN FUTURE EXPERIMENTS IN SPACE. SIX OF THE SEVEN EXPERIMENTS THAT MAKE UP THE OSS-1 PAYLOAD ON STS-5, OSS-1-01 TO OSS-1-06 ARE MOUNTED ON THE SPACELAB PALLET AND THE SEVENTH EXPERIMENT, OSS-1-07, IS MOUNTED IN THE MID DECK DIRECTLY BELOW THE ORBITER CABIN. THE SPACELAB PALLET IS TRANSPORTED TO AND FROM ORBIT IN THE CARGO BAY OF THE SPACE SHUTTLE ORBITER, AND REMAINS THERE THROUGHOUT THE 7-DAY FLIGHT. THE PARAMETERS MEASURED BY THE PAYLOAD INCLUDE: (1) PLASMA, WAVES, AND FIELDS THAT EXIST IN THE AMBIENT ATMOSPHERE, THAT RESULT FROM PERTURBATIONS INDUCED BY THE MOTION OF THE ORBITER THROUGH THE MAGNETIZED PLASMA; AND THAT RESULT FROM 'INTERFERENCE' BECAUSE OF THE ORBITER/SPACELAB OPERATIONS SYSTEMS; (2) POLARIZATION IN SOLAR X-RAY BURSTS; (3) SOLAR FLUX IN THE WAVELENGTH RANGE 120-400 NANOMETERS; (4) ELECTRICAL CHARGING PROPERTIES OF THE ORBITER VEHICLE; (5) THERMAL PROPERTIES OF THE CANISTER EXPERIMENT; AND (6) OPTICAL PROPERTIES OF THE SHUTTLE-INDUCED ATMOSPHERES. IN ADDITION, THERE ARE MEASUREMENTS OF THE INFLUENCE OF WEIGHTLESSNESS ON THE LIGNEIFICATION IN DEVELOPING PLANT SEEDLINGS. AN INDUCED ENVIRONMENT CONTAMINATION MONITOR (IECM), DESIGNED AND PROVIDED BY THE MSFC, IS AN ENGINEERING PACKAGE FLOWN ON THE ORBITAL TEST FLIGHTS (OTFS) TO PROVIDE VERIFICATION MEASUREMENTS OF PARTICLES AND GASES DURING GROUND OPERATIONS, ASCENT, ON-ORBIT DESCENT, AND POST LANDING. IT CONTAINS A HUMIDITY MONITOR, DEW POINT HYGROMETER, AIR SAMPLER, CASCADE IMPACTOR, PASSIVE SAMPLE ARRAY, OPTICAL EFFECTS MODULE, TEMPERATURE-CONTROLLED QUARTZ CRYSTAL MICROBALANCE, CRYOGENIC QUARTZ CRYSTAL MICROBALANCE,

CAMERA/PHOTOMETER, AND A MASS SPECTROMETER.

----- OSS-1, BANKS-----

INVESTIGATION NAME- VEHICLE CHARGING AND POTENTIAL EXPERIMENT

NSSDC ID- SHOFT-4-04

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY  
PARTICLES AND FIELDS

PERSONNEL

PI - P.M. BANKS  
OI - W.J. RAITT  
OI - P.R. WILLIARSON  
OI - T. ODAYASHI

UTAH STATE U  
UTAH STATE U  
UTAH STATE U  
U OF TOKYO

BRIEF DESCRIPTION

THE OBJECTIVES OF THE VEHICLE CHARGING AND POTENTIAL EXPERIMENT ARE TO: (1) DETERMINE ELECTRIC POTENTIAL CHANGES ASSOCIATED WITH ORBITER AND EXPERIMENT OPERATION; (2) DETERMINE THE ELECTRICAL CHARGING PROPERTIES OF THE ORBITER VEHICLE; (3) DETERMINE ELECTRIC POTENTIAL CHANGES ARISING FROM ACTIVE ELECTRON EMISSION; (4) DETERMINE ELECTRICAL PROCESSES ASSOCIATED WITH CHARGING AND DISCHARGING OF VEHICLE DIELECTRIC SURFACES; (5) ASSESS THE ELECTRICAL RESPONSE OF THE VEHICLE TO LOW LEVELS OF ELECTRON EMISSION; (6) DOCUMENT THE OPERATION OF A LOW POWER ELECTRON ACCELERATOR IN THE ORBITER ENVIRONMENT; AND (7) EVALUATE THE SUITABILITY OF THE ORBITER BAY FOR IN SITU PLASMA MEASUREMENTS. TO ACHIEVE THESE OBJECTIVES THE FOLLOWING INSTRUMENTS ARE FLOWN: (1) TWO CHARGE AND CURRENT PROBES (CCP) TO MEASURE VEHICLE RETURN CURRENTS AND DIELECTRIC CHARGES AT TWO LOCATIONS IN THE BAY; (2) SPHERICAL RETARDING POTENTIAL ANALYZER/LANGMUIR PROBE (SRPA/LP) TO MEASURE VEHICLE POTENTIAL RELATIVE TO THE PLASMA, ELECTRON DENSITY, AND PLASMA TEMPERATURES; AND (3) A FAST PULSE ELECTRON GUN (FPEG) TO PROVIDE ELECTRON EMISSION WITH SHORT (500 NANoseconds) PULSES AND CAPABLE OF DC OPERATION FOR EXTENDED PERIODS OF TIME. THE GUN OPERATES ON A CURRENT OF 0.1 AMP AND A VOLTAGE OF 1 KV.

----- OSS-1, BRUECKNER-----

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR

NSSDC ID- SHOFT-4-03

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SCALAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER  
OI - J.D.F. BARTOE  
OI - D.K. PRINZ  
OI - M.E. VAN HOOSIER

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THE OBJECTIVES OF THE 'SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR' EXPERIMENT ARE TO: (1) MEASURE THE INTENSITY OF THE SOLAR ULTRAVIOLET CONTINUUM AT 180 NANOMETERS RELATIVE TO ITS INTENSITY AT 211 NANOMETERS WITH AN ACCURACY OF PLUS OR MINUS 1 PERCENT; (2) MEASURE THE RELATIVE SPECTRAL DISTRIBUTION OF THE SOLAR RADIANCE THROUGHOUT THE SPECTRAL REGION FROM 120 TO 400 NANOMETERS WITH AN ACCURACY OF 1 TO 5 PERCENT (DEPENDENT ON WAVELENGTH) USING A SINGLE INSTRUMENT; (3) MEASURE THE ABSOLUTE INTENSITY OF THE SOLAR SPECTRUM BETWEEN 120 TO 400 NANOMETERS WITH AN ABSOLUTE ACCURACY OF 6 TO 10 PERCENT, DEPENDING ON WAVELENGTH, AND TIE INTO HIGH-ACCURACY GROUND-BASED MEASUREMENTS ABOVE 300 NANOMETERS; AND (4) SEARCH FOR VARIABILITY OF THE SOLAR CONTINUUM AND EMISSION LINES ATTRIBUTABLE TO CHANGING LEVELS OF SOLAR ACTIVITY. THE INSTRUMENTATION CONSISTS OF TWO DOUBLE-DISPERSION SCANNING SPECTROMETERS, SEVEN DETECTORS, AN ULTRAVIOLET CALIBRATION SOURCE, AND A SOLAR POINTING ERROR SENSOR. THE SPECTROMETERS ARE SUN-POINTED AND HAVE A PLUS OR MINUS 0.5 DEG FIELD OF VIEW. ONE SPECTROMETER IS USED ALMOST CONTINUOUSLY DURING THE DAYLIGHT PORTION OF EACH SOLAR-POINTED ORBIT TO MEASURE THE SHORT TIME VARIATIONS OF THE SOLAR ULTRAVIOLET FLUX. THE SECOND SPECTROMETER IS USED ONLY ONCE A DAY TO TRACK ANY CHANGE IN SENSITIVITY OF THE FIRST SPECTROMETER. SIMILARLY, TWO OF THE FIVE PHOTODIODES ARE USED ONLY ONCE A DAY. A DEUTERIUM LAMP IS USED AS THE TRANSFER STANDARD SOURCE FOR DAILY IN-FLIGHT CALIBRATION AND STABILITY TRACKING OF BOTH SPECTROMETERS AND ALL SEVEN DETECTORS.

----- OSS-1, COWLES-----

INVESTIGATION NAME- INFLUENCE OF WEIGHTLESSNESS IN LIGNIFICATION OF PLANT SEEDLINGS

NSSDC ID- SHOFT-4-07

INVESTIGATIVE PROGRAM  
CODE SB

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - J.R. COWLES  
OI - N.V. SCHILD

U OF HOUSTON  
U OF HOUSTON

BRIEF DESCRIPTION

AN OBJECTIVE OF THE STUDY OF INFLUENCE OF WEIGHTLESSNESS ON LIGNIFICATION IN DEVELOPING PLANT SEEDLINGS EXPERIMENT IS TO USE THE FLIGHT DATA TO PROVIDE CONFIRMATION OR REJECTION OF THE HYPOTHESIS THAT GRAVITY EXERTS A POSITIVE CONTROL UPON THE PATHWAY OF LIGNIFICATION, AND THAT THERE IS A SYNERGETIC INTERACTION WITH THE ATMOSPHERE. A SERIES OF COMPLEMENTARY EXPERIMENTS WITH PASSIVE EXPOSURE OF COMPACT PLANT SYSTEMS IN A SMALL GROWTH CHAMBER WILL BE FLOWN. MEASUREMENTS WILL BE MADE OF LIGNIFICATION AND ASSOCIATED ENZYMES, AND OF GIBBERELLS METABOLITES. THE EXPERIMENT PROVIDES EXPERIENCE WITH, AND DEVELOPMENT OF TECHNIQUES AND HARDWARE FOR, PLANT HANDLING IN SPACE.

----- OSS-1, NOVICK-----

INVESTIGATION NAME- SOLAR FLARE X-RAY POLARIMETER EXPERIMENT

NSSDC ID- SHOFT-4-02

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
X-RAY ASTRONOMY  
SOLAR PHYSICS

PERSONNEL

PI - R. NOVICK  
OI - A.S. WOLFF

COLUMBIA U  
COLUMBIA U

BRIEF DESCRIPTION

THE OBJECTIVES OF THE SOLAR FLARE X-RAY POLARIMETER EXPERIMENT ARE TO MEASURE THE: (1) DEGREE OF POLARIZATION IN SOLAR X-RAY BURSTS; (2) TEMPORAL DEPENDENCE OF THE X-RAY POLARIZATION; (3) ENERGY DEPENDENCE OF THE X-RAY POLARIZATION; (4) POLARIZATION ANGLE OF THE X-RAY EMISSION; AND (5) SOLAR X-RAY FLARE EMISSION BETWEEN 5 AND 38 KEV. IN ADDITION, THE CORRELATION OF THE X-RAY POLARIZATION WITH OTHER PHENOMENA ASSOCIATED WITH SOLAR FLARES IS STUDIED, AND THE SYSTEMATIC EFFECTS OF THE OPERATION OF THE INSTRUMENT IN A SATELLITE ENVIRONMENT IS EVALUATED. THE FLIGHT INSTRUMENT, A SCATTER BLOCK POLARIMETER, CONSISTS OF THREE DETECTORS MOUNTED IN AN EQUILATERAL CONFIGURATION. THERE ARE FOUR COUNTERS AND FOUR RECTANGULAR LITHIUM SCATTERING BLOCKS PER DETECTOR. THE POLARIMETER IS POINTED AT THE SUN DURING THE OCCURRENCE OF SOLAR FLARES AND WHEN SUN-POINTED IT HAS A THREE-DEG FIELD OF VIEW. THE INSTRUMENT USES THE ANGULAR DEPENDENCE OF THE INCOHERENT SCATTERING CROSS SECTION OF ELECTRONS TO DETECT THE DIRECTION OF THE INCIDENT PHOTON'S ELECTRIC VECTOR. THE DIFFERENCE IN COUNTING RATES IN DETECTORS AT DIFFERENT AZIMUTHS RELATIVE TO THE EARTH-SUN LINE IS THE SIGNATURE OF THE X-RAY POLARIZATION.

----- OSS-1, OLENDORF-----

INVESTIGATION NAME- THERMAL CANISTER EXPERIMENT

NSSDC ID- SHOFT-4-05

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - S. OLENDORF

NASA-GSFC

BRIEF DESCRIPTION

THE OBJECTIVES OF THE THERMAL CANISTER EXPERIMENT ARE TO: (1) DEMONSTRATE UNDER THE DIVERSE THERMAL ENVIRONMENTS OF THE SPACE SHUTTLE THE PERFORMANCE OF A THERMAL CANISTER UTILIZING FEEDBACK VARIABLE CONDUCTANCE HEATPIPES, AND (2) DEMONSTRATE THE ABILITY OF THE SYSTEM TO MAINTAIN TEMPERATURE CONTROL WITHIN NARROW LIMITS BY VARYING INTERNAL POWER DISSIPATION OVER A WIDE RANGE AND MONITORING THERMAL BEHAVIOR. TO ACHIEVE THESE OBJECTIVES A CANISTER 1 M X 1 M X 3 M AND WEIGHING 160 KG, FIXED CONDUCTANCE CANISTER HEATPIPES, VARIABLE CONDUCTANCE HEATPIPES, A RADIATOR AND RADIATOR HEATPIPES, CONTROL ELECTRONICS AND DATA ACQUISITION AND COMMAND SYSTEM, AND SIMULATED INSTRUMENT HEAT LOADS (HEATERS) WITHIN THE CANISTER ARE FLOWN. THE THERMAL CANISTER IS BUILT IN AS CLOSE A CONFIGURATION AS POSSIBLE TO THE FLIGHT APPLICATION AND MOUNTED ON A STRUCTURE TOGETHER WITH SUPPORT ELECTRONICS. HEATERS WITHIN THE CANISTER SIMULATE INSTRUMENT POWER DISSIPATION. CANISTERS DEVELOPED FOR FLIGHT INSTRUMENTS ARE A STANDARD INVENTORY ITEM FOR FUTURE USE AS REQUIRED.

----- OSS-1, SHAWHAN-----

INVESTIGATION NAME- PLASMA DIAGNOSTIC PACKAGE

NSSDC ID- SHOFT-4-01

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SPACE PLASMAS  
PARTICLES AND FIELDS

ORIGINAL PAGE IS  
OF POOR QUALITY

**PERSONNEL**

PI - D.O. SHANAHAN	U OF IOWA
OI - L.A. FRANK	U OF IOWA
OI - D.A. GURNETT	U OF IOWA
OI - N. D'ANGELO	U OF IOWA
OI - M.C. BRINTON	NASA-GSFC
OI - D.L. REASONER	NASA-RFSC
OI - M. STONE	NASA-RFSC

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THE PLASMA DIAGNOSTIC PACKAGE (PDP) EXPERIMENT ARE TO: (1) STUDY THE ORBITER-MAGNETOPHYSICAL INTERACTIONS; (2) MAP THE LOCALIZED SOURCES OF ELECTRIC AND MAGNETIC FIELDS; (3) DEMONSTRATE THE OPERATION OF THE PDP PRIOR TO ITS FLIGHT ON SPACELAB 2; AND (4) DETERMINE THE CHARACTERISTICS OF THE ELECTRON BEAM EMITTED FROM THE FAST-PULSE ELECTRON GUN (FPEG) OF EXPERIMENT SHOFT-4-04. SPECIFICALLY, THE PDP MEASURES THE PLASMA, WAVES, AND FIELDS THAT EXIST IN THE AMBIENT IONOSPHERE, THOSE RESULT FROM THE PERTURBATIONS INDUCED BY THE MOTION OF THE ORBITER THROUGH THE MAGNETIZED PLASMA, AND THOSE RESULT FROM 'INTERFERENCE' BECAUSE OF THE ORBITER/SPACELAB OPERATION SYSTEM. THE ELECTROMAGNETIC INTERFERENCE AND PLASMA CONTAMINATION WITHIN THE ORBITER BAY ARE MAPPED BY USING THE REMOTE MANIPULATOR ARM TO SCAN THE PDP OVER THE BAY AREA. THE FOLLOWING INSTRUMENTS MAKE UP THE PDP: A LOW ENERGY PHOTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER (LEPEDEA) TO MEASURE NONTERRESTRIAL ELECTRON AND ION ENERGY SPECTRA AND PITCH ANGLE DISTRIBUTIONS FOR PARTICLE ENERGIES BETWEEN 2 EV AND 50 KEV; AN AC MAGNETIC FIELD SEARCH COIL SENSOR TO MEASURE MAGNETIC FIELDS WITH A FREQUENCY RANGE OF 10 HZ TO 30 KHZ; AC ELECTRIC AND ELECTROSTATIC WAVE ANALYZERS TO MEASURE ELECTRIC FIELDS WITH A FREQUENCY RANGE OF 10 HZ TO 1 GHz; A DC ELECTROSTATIC DOUBLE PROBE WITH SPHERICAL SENSORS TO MEASURE ELECTRIC FIELDS IN ONE AXIS FROM 2 MV/M TO 2 V/M; A DC TRIAXIAL PLUNGE MAGNETOMETER TO MEASURE MAGNETIC FIELDS FROM 12 MILLIGAUGES TO 1.5 GAUSS; A LANGMUIR PROBE TO MEASURE THERMAL ELECTRON DENSITIES BETWEEN 10<sup>-10</sup> AND 10<sup>-7</sup> PER CUBIC CM AND DENSITY IRREGULARITIES WITH 10-M TO 10-KM SCALE SIZE; A RETARDING POTENTIAL ANALYZER/DIFFERENTIAL VELOCITY PROBE TO MEASURE ION NUMBER DENSITY FROM 10<sup>-2</sup> TO 10<sup>-7</sup> PER CUBIC CM; THE ENERGY DISTRIBUTION FUNCTION BELOW 16 EV; AND DIRECTED ION VELOCITIES UP TO 15 KM/SEC; AN ION MASS SPECTROMETER TO MEASURE ION DENSITIES FROM 20 TO 2.5<sup>7</sup> IONS PER CUBIC CM IN THE MASS RANGE FROM 1 TO 60 AMU; AND A PRESSURE GAUGE TO MEASURE AMBIENT PRESSURE FROM 10<sup>-8</sup> TO 10<sup>-7</sup> TORR.

----- OSS-1, WEINBERG -----

**INVESTIGATION NAME** - CHARACTERISTICS OF SHUTTLE/SPACELAB INDUCED ATMOSPHERE

**NSSDC ID** - SHOFT-4-06      **INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - J.L. WEINBERG	SPACE ASTRONOMY LAB
OI - D.W. SCHUERMAN	STATE U OF NEW YORK
OI - F. SIOVANE	STATE U OF NEW YORK

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THE CHARACTERISTICS OF SHUTTLE/SPACELAB INDUCED ATMOSPHERE EXPERIMENT ARE TO: (1) DETERMINE THE OPTICAL PROPERTIES OF THE SHUTTLE INDUCED ATMOSPHERE; (2) OBSERVE THE DIFFUSE ASTRONOMICAL BACKGROUND; AND (3) OBSERVE THE EARTH'S LIMB IN THE STUDY OF ATMOSPHERIC AEROSOLS. THE EXISTING SKYLAB PHOTOMETER/CAMERA SYSTEM ADAPTED TO BE PALLET MOUNTED IS USED. THE PHOTOELECTRIC POLARIMETER MEASURES INTENSITY AND POLARIZATION OF SKY BRIGHTNESS IN 10 COLORS BETWEEN 400 AND 820 NANOMETERS. IT HAS A SELF-CONTAINED POINTING SYSTEM, AND AUTOMATIC SHUTDOWN AND START-UP PROVISIONS TO ALLOW MAXIMUM VIEWING TIME. THE INSTRUMENT CAN BE PROGRAMMED TO DO SKY SURVEY IN SEVERAL MODES. THE EXPERIMENT CYCLE IS SELECTABLE THROUGH AN AUTOMATIC PROGRAMMER.

\*\*\*\*\* SAN MARCO-B/L\*\*\*\*\*

**SPACECRAFT COMMON NAME** - SAN MARCO-B/L  
**ALTERNATE NAMES** -

**NSSDC ID** - SM-0L

**LAUNCH DATE** - 11/08/81      **WEIGHT** - 200. KG  
**LAUNCH SITE** - SAN MARCO PLATFORM, OFF COAST OF KENYA  
**LAUNCH VEHICLE** - SCOUT

**SPONSORING COUNTRY/AGENCY**

ITALY	CRA
UNITED STATES	NASA-OSS

**PLANNED ORBIT PARAMETERS**

ORBIT TYPE	GEOCENTRIC
ORBIT PERIOD	100. MIN
PERIAPELIS	290. KM ALT

INCLINATION	5. DEG
APOPELIS	1010. KM ALT

**PERSONNEL**

MS - R.B. WEINER	NASA HEADQUARTERS
SC - E.R. SCHERLING	NASA HEADQUARTERS
PM - R.S. TATUM	NASA-GSFC
PS - N.W. SPENCER	NASA-GSFC

**BRIEF DESCRIPTION**

THE PRIMARY PURPOSE OF THE RESEARCH SATELLITES SAN MARCO-B/L AND -D/M IS TO EXPLORE THE RELATIONSHIP BETWEEN SOLAR ACTIVITY AND METEOROLOGICAL PHENOMENA WITH EMPHASIS ON LOWER ATMOSPHERIC WINDS AND THERMOSPHERE-IONOSPHERE PHENOMENA FROM LOW (SAN MARCO-B/L) AND MULTISTATIONARY (SAN MARCO-D/M) ORBITS. TWO SCOUT LAUNCH VEHICLES WILL INJECT BOTH SPACECRAFT INTO MUTUALLY PREDETERMINED ORBITS. BOTH SPACECRAFT HAVE PLANNED MISSION LIFETIMES OF 1.5 YR. THE SCIENCE INVESTIGATIONS IN SM-0L WILL MAKE USE OF THE FOLLOWING FIVE FLIGHT SENSORS: A DRAG BALANCE FOR DETERMINING NEUTRAL DENSITY, A WIND AND TEMPERATURE SPECTROMETER, AN ION VELOCITY INSTRUMENT, AN AIRGLOW SOLAR SPECTROMETER, AND AN ELECTRIC FIELD METER. THE SM-0L SATELLITE IS A 96.5-CM-DIAMETER SPHERE WITH FOUR 48-CM CANTED MONPOLE TELEMETRY ANTENNAS AND THREE ORTHOGONAL PAIRS OF ELECTRIC FIELD PROBE SENSORS (ONE PAIR ORIENTED ALONG THE SPACECRAFT SPIN AXIS). AN INTERNAL STRUCTURAL CYLINDER (26-CM DIAM) EXTENDS SLIGHTLY THROUGH THE SPHERE AND IS COINCIDENT WITH THE SATELLITE SPIN AXIS. THE POWER SUPPLY CONSISTS OF A SOLAR CELL ARRAY SPLIT INTO TWO SECTIONS, TWO RECHARGEABLE NICKEL-CADMIUM BATTERIES, AND ASSOCIATED CIRCUITRY. THE SATELLITE ATTITUDE DATA ARE PROVIDED BY A TRIAXIAL MAGNETOMETER, A HORIZON SENSOR, AND A DIGITAL SUN SENSOR. A MAGNETIC TORQUING SYSTEM IS USED TO CONTROL SPIN RATE AND SPACECRAFT ATTITUDE. A TAPE RECORDER WILL RECORD THE PCM TELEMETRY AT 6000 BPS FOR A MAXIMUM PERIOD OF 90 MIN. THE TRANSMISSION TO THE GROUND WILL BE EITHER IN REAL TIME AT 6000 BPS OR ON RECORDER PLAYBACK AT 72 KBS.

----- SAN MARCO-B/L, BROGLIO-----

**INVESTIGATION NAME** - DRAG BALANCE AND AIR DENSITY

**NSSDC ID** - SM-0L -01      **INVESTIGATIVE PROGRAM**  
CODE ST/C0-OP

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - L. BROGLIO	NATL RES COUNC ITALY
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**BRIEF DESCRIPTION**

THE DRAG BALANCE INSTRUMENT, WHICH IS AN INTEGRAL PART OF THE SATELLITE, CONSISTS OF AN INNER MASS, AN ELASTIC ELEMENT, AND AN OUTER SHELL. THE DRAG BALANCE IS THE CONNECTING ELASTIC ELEMENT BETWEEN THE OUTER LIGHT SHELL AND THE INNER HEAVY BODY. THE CENTER OF THE BALANCE IS LOCATED AT THE SATELLITE GEOMETRIC CENTER, OR THAT POINT WHICH IS THE GEOMETRIC CENTER BOTH OF THE INNER BODY AND THE SHELL. THIS INSTRUMENT MEASURES THE RELATIVE TRANSLATIONS BETWEEN THE SHELL AND THE INNER BODY BOTH IN VALUE AND DIRECTION, RESOLVING ANY RELATIVE TRANSLATION ALONG THREE MUTUALLY ORTHOGONAL AXES. THESE THREE AXES ARE FIXED TO THE BODY, ONE OF THEM BEING COINCIDENT WITH THE POLAR SYMMETRY AXIS OF THE SATELLITE. BEING FIRED TO THE SATELLITE, THE AXIS ROTATES WITH IT IN THE FREE-PRECESSION MOTION AROUND THE CENTER OF GRAVITY. THE BALANCE IS DESIGNED IN SUCH A WAY THAT THE MAXIMUM TRANSLATION BETWEEN THE SHELL AND THE DRUM IS GENERALLY OF THE ORDER OF 0.01 MM. IN MOST CASES THE DRAG FORCE AT THE ORBIT APOGEE IS NEGIGIBLE. AS A CONSEQUENCE, THE APOGEE DATA ARE USED TO GET AN IN-FLIGHT CALIBRATION OF THE BALANCE. THUS, THE TRANSLATION OF THE ELASTIC SYSTEM IS CHANGED INTO VOLTAGES THAT ARE AMPLIFIED AND DEMODULATED TO OBTAIN DC SIGNALS.

----- SAN MARCO-B/L, HANSON-----

**INVESTIGATION NAME** - ION VELOCITY INSTRUMENT (PLANAR RETARDING POTENTIAL ANALYZER) IVI

**NSSDC ID** - SM-0L -03      **INVESTIGATIVE PROGRAM**  
CODE ST/C0-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS  
IONOSPHERES

**PERSONNEL**

PI - W.B. HANSON	U OF TEXAS, DALLAS
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**BRIEF DESCRIPTION**

THIS EXPERIMENT IS A PLANAR RETARDING POTENTIAL ANALYZER, DESIGNED TO OBTAIN MEASUREMENTS OF RELATIVE THERMAL-ION VELOCITY, PLASMA DENSITY, AND ION TEMPERATURE. THE ION ANGLE-OF-ARRIVAL CAN BE DETERMINED BY USE IN THE INSTRUMENT DESIGN OF A SQUARE APERTURE COLLIMATOR AND A SPLIT COLLECTOR. TOGETHER WITH KNOWLEDGE OF SPACECRAFT MOTION, THIS ALLOWS COMPUTATION OF THE THREE-DIMENSIONAL THERMAL-ION MOTION ALONG THE ORBITAL PATH. PLASMA DENSITY AND TEMPERATURE IS CALCULATED BY INTERPRETATION OF THE VOLTAGE-APPERAGE PROFILE PRODUCED BY THE INSTRUMENT FOR A GIVEN IMPRESSED VOLTAGE PATTERN ON THE GRIDS AND COLLECTOR. ION VELOCITY MEASUREMENT IS PLANNED ONCE EACH SPACECRAFT SPIN PERIOD (10 S).

----- SAN MARCO-D/L, RAYNARD -----

INVESTIGATION NAME- 3-AXIS ELECTRIC FIELD INSTRUMENT (EPI)

NSSDC ID- SM-DL -00 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES

PERSONNEL

PI - H.C. RAYNARD  
OI - J.P. HEPPNER

NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT IS DESIGNED TO OBSERVE THE THREE COMPONENTS OF AMBIENT ELECTRIC FIELD OVER THE SATELLITE TRAJECTORY. THREE PAIRS, A PAIR FOR EACH COMPONENT, OF CYLINDRICAL PROBES ARE USED. A BODY IN A PLASMA ESTABLISHES A POTENTIAL RELATIVE TO THE PLASMA THAT MAINTAINS A CURRENT BALANCE. IF NO CURRENT IS DRAWN FROM THE BODY, ITS POTENTIAL DEPENDS ON THE POTENTIAL DIFFERENCES WITHIN THE PLASMA. FOR EACH COMPONENT, THE FLOATING POTENTIAL (OF EACH OF THE TWO SYMMETRICALLY PLACED PROBES WITH RESPECT TO THE SPACECRAFT) IS MEASURED. FROM THESE OBSERVATIONS, THE ELECTRIC FIELD CAN BE CALCULATED FOR KNOWN CONDITIONS OF SATELLITE MOTION, PROBE GEOMETRY, AND MAGNETIC FIELD. TWO PAIRS OF PROBES EXTEND FROM THE SATELLITE EQUATOR, AND ONE PAIR IS ORIENTED ALONG THE SPIN AXIS.

----- SAN MARCO-D/L, SCHMIDKE -----

INVESTIGATION NAME- AIRGLOW-SOLAR SPECTROMETER

NSSDC ID- SM-DL -02 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
AERONOMY  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - D. SCHMIDKE  
OI - F. FISCHER  
OI - P. KNOTHE  
OI - P. MASCHKE  
OI - C. MUNTHUR

INST FUR PHYS WELTRAUM  
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INST FUR PHYS WELTRAUM  
INST FUR PHYS WELTRAUM

BRIEF DESCRIPTION

THE SENSOR MEASURES THE EQUATORIAL DAY AND NIGHT AIR-GLOW, THE SOLAR RADIATION REFLECTED FROM THE SURFACE AND CLOUDS, THE SOLAR RADIATION OF INTERPLANETARY AND INTERGALACTIC ORIGIN REACHING THE SATELLITE IN THE SPECTRAL RANGE FROM 700 TO 20 NM WITH A SPECTRAL RESOLUTION OF 0.7 TO 8 NM. FOUR SPECTROMETERS, 4 GRATINGS, AND 17 MULTIPLIERS ARE USED. A TOROIDAL CONCAVE GRATING, OF RADIUS EQUAL TO 110.5 MM, WITH HOLOGRAPHICALLY FORMED CURVED LINES HAS BEEN CHOSEN TO ACHIEVE WAVELENGTH SCANNING BY ROTATING THE GRATING. THE SCANNING WILL BE PERFORMED BY STEPMOTOR NOTATION OF THE GRATING WITHIN PLUS OR MINUS 3 DEG, ONE STEP AT EACH REVOLUTION OF THE SATELLITE. EXIT SLITS ARE POSITIONED AT OPTIMUM DISTANCES NEAR THE ROWLAND CIRCLE. THE EXIT SLITS ARE FOLLOWED BY MULTIPLIERS. A FILTER WHEEL PROVIDES THREE FILTERS FOR EACH MULTIPLIER WORKING ABOVE 130 NM.

----- SAN MARCO-D/L, SPENCER -----

INVESTIGATION NAME- WIND AND TEMPERATURE SPECTROMETER (WATS)

NSSDC ID- SM-DL -04 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - N.W. SPENCER  
OI - G.R. CARIGHAN

NASA-GSFC  
U OF MICHIGAN

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE THE IN SITU NEUTRAL WINDS, NEUTRAL PARTICLE TEMPERATURES, AND THE CONCENTRATION OF SELECTED GASES. THREE COMPONENTS OF THE WINDS, ONE NORMAL TO THE SATELLITE DIRECTION, ARE MEASURED. TWO SCANNING BAFFLES ARE USED, ONE MOVING VERTICALLY IN FRONT OF THE SENSOR, AS WAS USED ON SATELLITE ATMOSPHERE EXPLORER-C (AE-C) NEUTRAL ATMOSPHERE TEMPERATURE EXPERIMENT (NATE), AND ONE MOVING HORIZONTALLY NEARLY IDENTICAL IN CONCEPT TO THE VERTICALLY SCANNING BAFFLE AND INCORPORATED ON THE WATE FOR AE-D AND -E. THE MAGNITUDES OF THE HORIZONTAL AND VERTICAL COMPONENTS OF THE WIND NORMAL TO THE SPACECRAFT VELOCITY VECTOR ARE COMPUTED FROM MEASUREMENTS OF THE ANGULAR RELATIONSHIP BETWEEN THE NEUTRAL PARTICLE STREAM AND THE SENSOR. THE COMPONENT OF THE TOTAL STREAM VELOCITY IN THE SATELLITE DIRECTION IS MEASURED DIRECTLY BY THE RETARDING POTENTIAL QUADRUPOLE (RPQ) THROUGH DETERMINATION OF THE REQUIRED RETARDING POTENTIAL. FROM THESE QUANTITATIVE MEASUREMENTS THE WIND VECTOR IS COMPUTED. THE TEMPERATURE TECHNIQUE USED ON THE WATE PROVIDES THE BASIS FOR THE TEMPERATURE MEASUREMENTS FOR

THIS MISSION. IT SHOULD BE EMPHASIZED THAT THE WIND AND TEMPERATURE MEASUREMENTS CAN BE PERFORMED IN THE SAME OPERATING MODE. FOR COMPOSITION MEASUREMENTS, THE RPQ MASS SPECTROMETER IS USED IN A SEPARATE OPERATING MODE DESIGNED FOR THIS PURPOSE.

----- SAN MARCO-D/M -----

SPACECRAFT COMMON NAME- SAN MARCO-D/M  
ALTERNATE NAMES-

NSSDC ID- SM-DM

LAUNCH DATE- 11/08/82 WEIGHT- 65. KG  
LAUNCH SITE- SAN MARCO PLATFORM, OFF COAST OF KENYA  
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GSFC  
ITALY ERA

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOSTATIONARY  
ORBIT PERIOD- 240. MIN INCLINATION- 2.9 DEG  
PERIASTRIS- 420. KM ALT APOLLOPS- 27400. KM ALT

PERSONNEL  
MG - R.D. WEINHOLD  
SC - E.B. SCHERLING  
PM - R.S. TATUM  
PS - N.W. SPENCER  
NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
THE PRIMARY PURPOSE OF THE RESEARCH SATELLITES SAN MARCO-D/L AND -D/M IS TO EXPLORE THE RELATIONSHIP BETWEEN SOLAR ACTIVITY AND METEOROLOGICAL PHENOMENA WITH EMPHASIS ON LOWER ATMOSPHERIC WINDS AND THERMOSPHERE-IONOSPHERE PHENOMENA FROM LOW (SAN MARCO-D/L) AND MULTISTATIONARY (SAN MARCO-D/M) ORBITS. TWO SCOUT LAUNCH VEHICLES WILL INJECT BOTH SPACECRAFT INTO MUTUALLY PREDETERMINED ORBITS. BOTH SPACECRAFT HAVE PLANNED MISSION LIFETIMES OF 1.5 YEARS. SAN MARCO-D/M IS BUILT AROUND A SINGLE EXPERIMENT. THE PURPOSE OF THIS SPACECRAFT IS TO MONITOR CLOUD COVER AND OZONE CONTENT. WITH ONE-THIRD THE PERIOD OF AN EARTH-SYNCHRONOUS OR STATIONARY SATELLITE, OBSERVATIONS MAY BE REPEATED THREE TIMES PER DAY. THE GENERAL APPEARANCE OF SM-D/M IS THAT OF TWO CYLINDERS WITH A COMMON AXIS, ONE WITH DIAMETER OF 70 CM AND HEIGHT OF 40 CM, WITH THE SECOND CYLINDER EXTENDING FROM THE END OF THE FIRST FOR AN ADDITIONAL 42 CM AND WITH A DIAMETER OF ABOUT 32 CM. THE SURFACE OF THE LARGER CYLINDER IS COVERED WITH 1296 SOLAR CELLS THAT FEED 2 RECHARGEABLE BATTERY PACKS. THE SPACECRAFT IS SPIN STABILIZED ALONG THE AXIS OF ITS CYLINDRICAL STRUCTURE, AND SCANNING OPERATION FOR THE INSTRUMENT IS DEPENDENT UPON THE SATELLITE SPIN.

----- SAN MARCO-D/M, BROGLIO -----  
INVESTIGATION NAME- IR RADIOMETER FOR MONITORING CLOUD COVER AND OZONE CONTENT

NSSDC ID- SM-DR -01 INVESTIGATIVE PROGRAM  
CODE ST/CO-OP  
INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
ATMOSPHERIC PHYSICS

PERSONNEL  
PI - L. BROGLIO  
Natl Res Coun Italy

BRIEF DESCRIPTION  
THIS RADIOMETER EXPERIMENT IS DESIGNED TO MONITOR CLOUD COVER AND OZONE CONTENT FROM A NEAR-EQUATORIAL ORBIT. A HIGH-RESOLUTION (25-KM INSTANTANEOUS FIELD OF VIEW-IFOV) AND LOW-RESOLUTION (200-KM IFOV) MODE ARE BOTH AVAILABLE. EITHER MODE IS OPERATED THROUGH A COMMON TELESCOPE, FILTER-WHEEL, AND SCAN-MIRROR SYSTEM. THERE ARE THREE MG, CR, TE (HERCUM, CADMIUM, TELLURIUM) DETECTORS. THE HIGH-RESOLUTION (HR) MAPPING OPERATES IN A 10.9-12.5 MICRORAM. THE LOW-RESOLUTION (LR) MULTISPECTRAL MAPPING OPERATES IN THE SAME BAND (CHANNEL 3) PLUS SIX OTHER BANDS BETWEEN 8.65 AND 15.05 MICRORAM. BANDWIDTH FOR EACH OF THESE 8.65 BANDS IS LESS THAN .35 MICRORAM, AND THE LOW EDGE OF THE BANDWIDTHS ARE AT 8.65, 9.59 (CO2), 13.83, 14.14 (CO2), 14.59 (CO2) AND 14.90 (CO2) MICRORAM. IN THE LR MODE, TWO CHANNELS ARE SELECTED FOR SIMULTANEOUS OBSERVING. SCANNING IS ACCOMPLISHED BY SPACECRAFT SPIN PLUS MIRROR STEPPING ONCE EACH REVOLUTION. ONE FRAME REQUIRES 6.5 (IMAGING) TO 7.5 (SOUNDING) MIN AND CALIBRATION OCCURS ONCE EACH FRAME.

----- SME -----

SPACECRAFT COMMON NAME- SME  
ALTERNATE NAMES- SOLAR MESOSPHERE EXP

NSSDC ID- SME

LAUNCH DATE- 09/30/81 WEIGHT- 105. KG  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY  
UNITED STATES

NASA-GDS

## PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 94.6 MIN  
PERIAPSIS- 800. KM ALTINCLINATION- 97.6 DEG  
APOAPSIS- 800. KM ALT

## PERSONNEL

MG - M.D. WERNER  
SC - S.G. TILFORD  
PR - J.J. PAULSON  
PB - C.A. BARTHNASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-JPL  
U OF COLORADO

## BRIEF DESCRIPTION

THE SOLAR MESOSPHERE EXPLORER (SME) MISSION OBJECTIVE IS TO UNDERSTAND WHAT PHYSICAL PHENOMENA CAUSE CHANGES IN THE DENSITY AND DISTRIBUTION OF THE EARTH'S OZONE. THIS OBJECTIVE IS ACCOMPLISHED BY MEASURING OZONE PARAMETERS AND THE PROCESSES IN THE MESOSPHERE AND UPPER STRATOSPHERE THAT DETERMINE THEIR VALUES. SIMULTANEOUS MEASUREMENTS ARE MADE OF OZONE, THE SOLAR ULTRAVIOLET RADIATION THAT PRODUCES AND DESTROYS IT, AND THE AMOUNT OF WATER VAPOR AND NITROGEN DIOXIDE WHOSE PHOTOASSOCIATION PRODUCTS CAUSE CATALYTIC DESTRUCTION OF OZONE. TEMPERATURE AND PRESSURE ARE ALSO MEASURED. THE SATELLITE EXPERIMENT COMPLEMENT CONSISTS OF A SOLAR ULTRAVIOLET SPECTROMETER, AN OZONE UV SPECTROMETER, AN INFRARED RADIOMETER, AN INFRARED SPECTROMETER, AND A NITROGEN DIOXIDE SPECTROMETER. IN ADDITION, A SOLAR PHOTON ALARM MECHANISM IS CARRIED TO MEASURE THE INTEGRATED SOLAR FLUX IN THE RANGE 30-500 REV. SPIN STABILIZED AT ABOUT 8 RPM. THE SATELLITE MOVES IN A 3 A.M. - 3 P.M. SUN-SYNCHRONOUS ORBIT. THE SPACECRAFT SHAPE IS THAT OF A EIGHT OCTAGONAL PRISM SLIGHTLY UNDER 1 M IN DIAMETER AND .75 M IN LENGTH. THE BASE MODULE HOUSES ALL SPACECRAFT SUBSYSTEMS EXCEPT THE SCIENTIFIC PAYLOAD AND DATA STORAGE. THE OBSERVATORY MODULE CONTAINING THE FIVE SCIENTIFIC INSTRUMENTS, ASSOCIATED ENGINEERING SENSORS, AND THE DATA STORAGE SYSTEM IS ATTACHED AS AN ASSEMBLY TO ONE OF THE OCTAGON FACES OF THE BASE MODULE. THE LAUNCH VEHICLE ADAPTER IS MOUNTED TO THE OPPOSITE OCTAGONAL FACE. THE SPIN AXIS IS ORIENTED NORMAL TO THE ORBITAL PLANE IN THE DATA-TAKING MODE. A MAGNETIC CONTROL SYSTEM MAINTAINS THE ATTITUDE OF THE SPIN AXIS TO WITHIN PLUS OR MINUS 1 DEG PITCH AND PLUS OR MINUS 2 DEG YAW, AND IS NOT USED DURING DATA-TAKING PERIODS. THERE IS A SEPARATE SPIN RATE CONTROL. THE COMMAND SYSTEM IS CAPABLE OF EXECUTING EITHER DISCRETE OR MODAL COMMANDS IN REAL TIME OR FROM STORED PROGRAM CONTROL. POWER IS SUPPLIED BY A SOLAR CELL ARRAY. THE TELEMETRY SYSTEM IS PCM AND CAN BE USED EITHER IN A REAL TIME OR IN A TAPE RECORDER MODE.

----- SME, BARTH-----

## INVESTIGATION NAME- UV OZONE

NSSDC ID- SME -01

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

## PERSONNEL

PI - C.A. BARTH  
OI - G.J. BOTTMAN  
OI - R.J. THOMAS  
OI - J.C. GILLE  
OI - A.J. STEWART  
OI - C.W. HORN  
OI - P.J. CRUTZEN  
OI - R.E. DICKINSON  
OI - P.L. BAILEY  
OI - J.F. NOHON  
OI - G.E. THOMAS  
OI - J. LONDONU OF COLORADO  
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## BRIEF DESCRIPTION

THE OBJECTIVE OF THE ULTRAVIOLET OZONE EXPERIMENT IS TO MEASURE OZONE ABSORPTION OF RAYLEIGH-SCATTERED SUNLIGHT IN THE MIDDLE ULTRAVIOLET REGION. A DUAL CHANNEL EBERT-FASTIE SPECTROMETER OPERATING IN THE REGIONS 2460-3100 Å AND 2710-3350 Å A VIEW NORMAL TO THE SPIN AXIS. THE FIELD OF VIEW SWEEPS THROUGH THE LIMB SAMPLING A SUCCESSION OF 20 ELEMENTS OF THE ATMOSPHERE, EACH APPROXIMATELY 3.5 KM IN HEIGHT AT THE EARTH'S LIMB.

----- SME, BARTH-----

## INVESTIGATION NAME- INFRARED RADIOMETER

NSSDC ID- SME -02

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

## PERSONNEL

PI - C.A. BARTH  
OI - G.J. BOTTMAN  
OI - R.J. THOMAS  
OI - J.C. GILLE  
OI - P.L. BAILEY  
OI - J.F. NOHON  
OI - A.J. STEWARTU OF COLORADO  
U OF COLORADO  
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NATL CTR FOR ATROS RES  
NATL CTR FOR ATROS RES  
NOAA  
U OF COLORADOOI - C.W. HORN  
OI - G.E. THOMAS  
OI - J. LONDON  
OI - P.J. CRUTZEN  
OI - R.E. DICKINSONU OF COLORADO  
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## BRIEF DESCRIPTION

THE OBJECTIVE OF THE INFRARED RADIOMETER EXPERIMENT IS TO DETERMINE THE ALTITUDE-MIXING RATIO PROFILES FOR WATER AND OZONE FROM THERMAL EMISSIONS. PRESSURE AND TEMPERATURE ARE ALSO DETERMINED. A FOUR-CHANNEL RADIOMETER/TELESCOPE WITH TWO FILTER-DETECTOR COMBINATIONS OPERATING IN THE MICRONESTER REGIONS 6.1-7.2, 8.6-10.6, 14.7-15.7, AND 15.9-17.5 VIEWS NORMAL TO THE SPIN AXIS. THE FIELD OF VIEW SWEEPS THROUGH THE LIMB SAMPLING A SUCCESSION OF 20 ELEMENTS OF THE ATMOSPHERE, EACH APPROXIMATELY 3.5 KM IN HEIGHT AT THE EARTH'S LIMB.

----- SME, BARTH-----

## INVESTIGATION NAME- 1.27 MICRONESTER AIRGLOW

NSSDC ID- SME -03

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

## PERSONNEL

PI - C.A. BARTH  
OI - G.J. BOTTMAN  
OI - R.J. THOMAS  
OI - J.C. GILLE  
OI - P.L. BAILEY  
OI - J.F. NOHON  
OI - A.J. STEWART  
OI - C.W. HORN  
OI - G.E. THOMAS  
OI - J. LONDON  
OI - P.J. CRUTZEN  
OI - R.E. DICKINSONU OF COLORADO  
U OF COLORADO  
U OF COLORADO  
NATL CTR FOR ATROS RES  
NATL CTR FOR ATROS RES  
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NATL CTR FOR ATROS RES  
NATL CTR FOR ATROS RES

## BRIEF DESCRIPTION

THE OBJECTIVE OF THE 1.27-MICRONESTER AIRGLOW EXPERIMENT IS TO OBTAIN LIMP-SCANNING MEASUREMENTS OF THE 1.27-MICRONESTER AIRGLOW IN THE 50- TO 80-KM ALTITUDE RANGE, AND OF THE HYDROXYL EMISSION BETWEEN 0.8 AND 2.0 MICRONESTERS. A DUAL-CHANNEL EBERT-FASTIE SPECTROMETER OPERATING IN THE REGIONS 0.7-1.6 AND 1.2-2.0 MICRONESTERS VIEWS NORMAL TO THE SPIN AXIS. THE FIELD OF VIEW SWEEPS THROUGH THE LIMB SAMPLING A SUCCESSION OF 20 ELEMENTS OF THE ATMOSPHERE, EACH APPROXIMATELY 3.5 KM IN HEIGHT AT THE EARTH'S LIMB.

----- SME, BARTH-----

## INVESTIGATION NAME- VISIBLE NITROGEN DIOXIDE

NSSDC ID- SME -04

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

## PERSONNEL

PI - C.A. BARTH  
OI - G.J. BOTTMAN  
OI - R.J. THOMAS  
OI - J.C. GILLE  
OI - P.L. BAILEY  
OI - J.F. NOHON  
OI - A.J. STEWART  
OI - C.W. HORN  
OI - G.E. THOMAS  
OI - J. LONDON  
OI - P.J. CRUTZEN  
OI - R.E. DICKINSONU OF COLORADO  
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NATL CTR FOR ATROS RES  
NATL CTR FOR ATROS RES

## BRIEF DESCRIPTION

THE OBJECTIVE OF THE VISIBLE NITROGEN DIOXIDE EXPERIMENT IS TO MEASURE THE DISTRIBUTION OF NITROGEN DIOXIDE IN THE 20- TO 60-KM ALTITUDE REGION. A DUAL-CHANNEL EBERT-FASTIE SPECTROMETER OPERATING IN WAVELENGTH REGIONS OF 3250-4500 Å AND 5200-7700 Å A VIEW NORMAL TO THE SPIN AXIS. THE FIELD OF VIEW SWEEPS THROUGH THE LIMB SAMPLING A SUCCESSION OF 20 ELEMENTS OF THE ATMOSPHERE, EACH APPROXIMATELY 3.5 KM IN HEIGHT AT THE EARTH'S LIMB.

----- SME, BARTH-----

## INVESTIGATION NAME- SOLAR UV MONITOR

NSSDC ID- SME -05

INVESTIGATIVE PROGRAM  
CODE STINVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATROS RES
OI - P.L.	BAILEY	NATL CTR FOR ATROS RES
OI - J.F.	NOZON	NOAA
OI - A.J.	STEWART	U OF COLORADO
OI - C.W.	MORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	NATL CTR FOR ATROS RES
OI - R.E.	DICKINSON	NATL CTR FOR ATROS RES

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THE SOLAR ULTRAVIOLET MONITOR EXPERIMENT IS TO MONITOR THE INCOMING SOLAR RADIATION TO DETERMINE THE EFFECT ON THE OZONE CONCENTRATIONS. A DUAL-CHANNEL ENERGY-PASTIC SPECTROMETER OPERATING IN THE REGIONS 2200-3100 Å AND 1800-2800 Å HAS A LOOK DIRECTION AT 86° TO THE SPACECRAFT AXIS OF ROTATION. IN A 3 A.M. - 3 P.M. ORBIT THE SOLAR MONITOR SCANS THROUGH THE SUN ONCE PER SPACECRAFT REVOLUTION. THE ACCEPTANCE ANGLE OF THE INSTRUMENT IS PLUS OR MINUS 10 DEG.

-----  
SME: BARTH-----

**INVESTIGATION NAME:** SOLAR PROTON ALARM

**NSSDC ID:** SME - 06      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS

**PERSONNEL**

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATROS RES
OI - P.L.	BAILEY	NATL CTR FOR ATROS RES
OI - J.F.	NOZON	NOAA
OI - A.J.	STEWART	U OF COLORADO
OI - C.W.	MORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	NATL CTR FOR ATROS RES
OI - R.E.	DICKINSON	NATL CTR FOR ATROS RES

**BRIEF DESCRIPTION**

THE SOLAR PROTON ALARM EXPERIMENT DETECTS PROTONS BETWEEN 30 AND 500 REV. WHEN THE FLUX EXCEEDS A SELECTED VALUE THE INSTRUMENT SIGNALS AN OPPORTUNITY TO ALTER SCIENCE COMMANDS TO OBSERVE THE EFFECTS OF SOLAR PROTONS ON ATMOSPHERIC CONSTITUENTS.

-----  
SPACE SHUTTLE LDEF-A-----

**SPACECRAFT COMMON NAME:** SPACE SHUTTLE LDEF-A  
**ALTERNATE NAMES:** LONG DURATION EXPOSURE FACILITY LDEF

**NSSDC ID:** SSLDEF

**LAUNCH DATE:** 01/00/84      **WEIGHT:** 9200. KG  
**LAUNCH SITE:** CAPE CANAVERAL, UNITED STATES  
**LAUNCH VEHICLE:** SHUTTLE

**SPONSORING COUNTRY/AGENCY**  
UNITED STATES      NASA-GEST

**PLANNED ORBIT PARAMETERS**  
ORBIT TYPE: GEOSTATIONARY  
ORBIT PERIOD: 93.5 MIN  
PERIAPSIS: 360. KM ALT

INCLINATION: 28.5 DEG  
APOAPSIS: 360. KM ALT

**PERSONNEL**  
MG - H.C. HILL  
PM - W.H. KINARD

NASA HEADQUARTERS  
NASA-LARC

**BRIEF DESCRIPTION**

THE LDEF IS BEING DEVELOPED BY THE NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY AND THE NASA/LANGLEY RESEARCH CENTER TO ACCOMMODATE, USING SHUTTLE, A CLASS OF TECHNOLOGY, SCIENCE, AND APPLICATIONS EXPERIMENTS WHICH REQUIRE A FREE-FLYING EXPOSURE IN SPACE AND WHICH BENEFIT FROM POST-FLIGHT LABORATORY INVESTIGATIONS WITH THE RETRIEVED EXPERIMENT HARDWARE. IT IS PLANNED TO REGULARLY LAUNCH AND RECOVER LDEF AT APPROXIMATELY YEARLY INTERVALS. THE APPROVED EXPERIMENTS ARE NOW BEING DEVELOPED.

-----  
SPACE SHUTTLE LDEF-A, AHLBORN-----

**INVESTIGATION NAME:** ORBITAL LUBRICATION EXPERIMENT

**NSSDC ID:** SSLDEF -02      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - G.	AHLBORN
OI - V.	FRIEDEL

BALL AEROSPACE DIV  
BALL AEROSPACE DIV

**BRIEF DESCRIPTION**

THIS EXPERIMENT WAS DESIGNED TO EVALUATE THE CUMULATIVE EFFECTS OF SPACE ON LUBRICANT OILS. SMALL CHANGES CAUSED BY SPACE EXPOSURE ARE IMPORTANT TO SUCH PHYSICAL BEHAVIOR AS FRICTION AND SURFACE WETTING. RADIATION EFFECTS ARE VIRTUALLY UNKNOWN. LUBRICANTS CONSIDERED FOR TESTING INCLUDE SATURATED HYDROCARBONS, DI-ESTERS, SILICONES, PENE'AERTHITHIOL ESTERS, AND PERFLUOROPALKYL POLYETHERS.

-----  
SPACE SHUTTLE LDEF-A, BANRS-----

**INVESTIGATION NAME:** ION BEAM TEXTURED AND COATED SURFACES

**NSSDC ID:** SSLDEF -01      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - D.A.	BANRS
OI - M.J.	MIRTICH
OI - A.J.	WEIGAND

NASA-LERC  
NASA-LERC  
NASA-LERC

**BRIEF DESCRIPTION**

THIS EXPERIMENT MEASURES THE EFFECT OF THE SPACE SHUTTLE LAUNCH AND NEAR-EARTH SPACE ENVIRONMENT EXPOSURE ON THE OPTICAL PROPERTIES OF ION BEAM TEXTURED HIGH-ABSORBENCE SOLAR THERMAL CONTROL SURFACES. VERIFICATION OF THE DURABILITY OF THESE SURFACES IS CONDUCE TO THE ACCEPTANCE OF THIS TECHNOLOGY ON FUTURE SPACE SYSTEMS.

-----  
SPACE SHUTTLE LDEF-A, BLUE-----

**INVESTIGATION NAME:** EFFECTS OF LONG-DURATION EXPOSURE ON ACTIVE OPTICAL SYSTEMS COMPONENTS

**NSSDC ID:** SSLDEF -06      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - R.D.	BLUE
OI - J.J.	GALLAGHER
OI - R.G.	SHACKELFORD

GEORGIA INST OF TECH  
GEORGIA INST OF TECH  
GEORGIA INST OF TECH

**BRIEF DESCRIPTION**

THE EFFECTS OF SPACE EXPOSURE ON THE PERFORMANCE OF LASERS, RADIATION DETECTORS, AND OTHER OPTICAL COMPONENTS ARE MEASURED. FROM THE RESULTS OBTAINED, GUIDES FOR COMPONENT SELECTION ARE ESTABLISHED.

-----  
SPACE SHUTTLE LDEF-A, BOURRIEAU-----

**INVESTIGATION NAME:** OPTICAL FIBERS AND COMPONENTS

**NSSDC ID:** SSLDEF -03      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - J.	BOURRIEAU
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CERT/ONERA

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT IS TO EXAMINE THE RADIATION EFFECTS ON FIBER OPTIC WAVEGUIDES WHICH ARE USED AS IMPORTANT COMPONENTS IN NEW COMMUNICATION SYSTEMS, OPTOELECTRONIC CIRCUITS AND DATA LINKS. COMPARISONS OF RADIATION-INDUCED DAMAGES IN FLIGHT AND DURING LABORATORY TESTS ARE TO DETERMINE THE VALIDITY OF IRRADIATION TESTS WITH RADIOACTIVE SOURCES.

-----  
SPACE SHUTTLE LDEF-A, BRANDHORST, JR.-----

**INVESTIGATION NAME:** ADVANCED PHOTOVOLTAIC EXPERIMENT

**NSSDC ID:** SSLDEF -02      **INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - H.W.	BRANDHORST, JR.
OI - A.F.	FORESTIER

NASA-LERC  
NASA-LERC

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS FLOWN TO INVESTIGATE THE EFFECT OF SPACE EXPOSURE ON NEW SOLAR CELL AND ARRAY MATERIALS, TO EVALUATE THEIR PERFORMANCE, AND TO MEASURE LONG-TIME VARIATIONS IN THE SPECTRAL CONTENT OF SUNLIGHT. SOLAR CELLS ARE CALIBRATED FOR SPACE USE.

ORIGINAL PAGE IS  
OF POOR QUALITY

----- SPACE SHUTTLE LDEF-A, BUCKER-----

INVESTIGATION NAME- FREE FLYER BIOSTACK

NSSDC ID- SSLDEF -50 INVESTIGATIVE PROGRAM  
CODE SWCO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - H. BUCKER

DFVLR

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO INVESTIGATE THE BIOLOGICAL EFFECT OF THE STRUCTURED COMPONENTS OF COSMIC RADIATION DURING SPACE FLIGHT, WITH EMPHASIS ON THE EFFECTS OF INDIVIDUAL VERY HEAVY IONS. QUANTITATIVE ASSESSMENT OF THE HAZARDS OF HEAVY ION PARTICLES TO MAN IN SPACE PERMITS THE ESTABLISHMENT OF SUITABLE PROTECTION GUIDELINES FOR MAN AND BIOLOGICAL EXPERIMENTS IN THE FUTURE SPACE FLIGHTS.

----- SPACE SHUTTLE LDEF-A, CALHOUN-----

INVESTIGATION NAME- CASCADE VARIABLE CONDUCTANCE HEAT PIPE

NSSDC ID- SSLDEF -39 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - L.D. CALHOUN

MCDONNELL-DOUGLAS CORP

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO VERIFY THE CAPABILITY OF A VARIABLE-CONDUCTANCE HEAT PIPE SYSTEM TO PROVIDE PRECISE TEMPERATURE CONTROL OF LONG-LIFE SPACECRAFT, WITHOUT NEED OF FEEDBACK HEATER OR OTHER POWER SOURCES FOR TEMPERATURE ADJUSTMENT, UNDER CONDITIONS OF WIDELY VARYING POWER INPUT AND THE SPACE ENVIRONMENT.

----- SPACE SHUTTLE LDEF-A, CALLEN-----

INVESTIGATION NAME- SPACE TESTING OF HOLOGRAPHIC DATA STORAGE CRYSTALS

NSSDC ID- SSLDEF -08 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - W.R. CALLEN  
OI - T.K. GAYLORD

GEORGIA INST OF TECH  
GEORGIA INST OF TECH

BRIEF DESCRIPTION

THE EFFECT OF LONG SPACE EXPOSURE ON ELECTRO-OPTIC CRYSTALS FOR USE IN ULTRA-HIGH CAPACITY SPACE DATA STORAGE AND RETRIEVAL SYSTEMS IS TESTED. THE INFORMATION OBTAINED HELPS DEVELOP HIGH BIT CAPACITY RECORDER AND MEMORY SYSTEMS.

----- SPACE SHUTTLE LDEF-A, CRIFO-----

INVESTIGATION NAME- THIN METAL FILM AND EVAPORATED CATHODES PERFORMANCE IN SPACE

NSSDC ID- SSLDEF -40 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - J.F. CRIFO  
OI - J.M. BERSET

CNRSP-LPSP  
CNRSP-LPSP

BRIEF DESCRIPTION

THIS EXPERIMENT IS DESIGNED TO TEST THE SPACE BEHAVIOR OF VACUUM UV OPTICAL COMPONENTS (EUV THIN FILMS, UV GAS FILTERS, PHOTOCATHODES AND UV CRYSTAL FILTERS) AND TO PROVIDE DATA FOR THE DEVELOPMENT AND QUALIFICATION OF NEW COMPONENTS.

----- SPACE SHUTTLE LDEF-A, DELASI-----

INVESTIGATION NAME- EFFECTS OF THE SPACE ENVIRONMENT ON THE PROPERTIES OF METALLIZED DIELECTRICS

NSSDC ID- SSLDEF -20 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - R.J. DELASI  
OI - F. KUEHNE  
OI - M. ROSSI

GRUMMAN AEROSPACE CORP  
GRUMMAN AEROSPACE CORP  
GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION

THIS EXPERIMENT TESTS THE PERFORMANCE IN THE SPACE ENVIRONMENT OF METALLIZED DIELECTRIC STRUCTURES WHICH ARE BEING CONSIDERED FOR DIPOLE ARRAYS. TO OBTAIN QUANTITATIVE DATA ON THE DEGRADATION OF MECHANICAL, OPTICAL AND DIELECTRIC PROPERTIES, AND TO EVALUATE THE UTILITY OF COATINGS TO PREVENT OR RETARD DEGRADATION OF THESE STRUCTURES.

----- SPACE SHUTTLE LDEF-A, FELBECK-----

INVESTIGATION NAME- INFLUENCE OF SPACE EXPOSURE ON MECH PROPERTIES OF HI-TOUGHNESS GRAPHITE-EPOXY

NSSDC ID- SSLDEF -06

INVESTIGATIVE PROGRAM

CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - D.K. FELBECK

U OF MICHIGAN

BRIEF DESCRIPTION

THIS EXPERIMENT IS FLOWN TO TEST THE EFFECT OF EXTENDED EXPOSURE TO A SPACE ENVIRONMENT ON THE MECHANICAL PROPERTIES OF A SPECIALLY TOUGHENED 5208/T300 GRAPHITE-EPOXY COMPOSITE MATERIAL. SPECIMENS MADE BY RECENTLY DEVELOPED TECHNIQUES OF INTERMITTENT INTERLAMINAR BONDING ARE EXPOSED AND AFTERWARD TESTED FOR (1) FRACTURE TOUGHNESS, (2) TENSILE STRENGTH, AND (3) ELASTIC MODULUS.

----- SPACE SHUTTLE LDEF-A, FILZ-----

INVESTIGATION NAME- PASSIVE COSMIC RADIATION DETECTOR

NSSDC ID- SSLDEF -14

INVESTIGATIVE PROGRAM

CODE SC

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - R.C. FILZ  
OI - R. BEAUJEAN  
OI - P.J. McNULTY  
OI - C.L. PEACOCK  
OI - P.S. YOUNG

USAF GEOPHYS LAB  
U OF KIEL  
CLARKSON COLL OF TECH  
NASA-MSFC  
MISSISSIPPI STATE U

BRIEF DESCRIPTION

A PHOTOGRAPHIC EMULSION PACKAGE IS EXPOSED TO OBTAIN INFORMATION ON THE FLUX AND ENERGY SPECTRUM OF TRAPPED RADIATION.

----- SPACE SHUTTLE LDEF-A, FLAMAND-----

INVESTIGATION NAME- RULED AND HOLOGRAPHIC GRATINGS

NSSDC ID- SSLDEF -42

INVESTIGATIVE PROGRAM

CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - J. FLAMAND

INSTRUMENT SA/JOBIN-R

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO INVESTIGATE THE LONG-TERM STABILITY OF VARIOUS RULED AND HOLOGRAPHIC GRATINGS WHICH ARE USED IN SPACECRAFT OPTICAL AND ELECTRO-OPTICAL INSTRUMENTS.

----- SPACE SHUTTLE LDEF-A, GREGORY-----

INVESTIGATION NAME- THE INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDE

NSSDC ID- SSLDEF -19

INVESTIGATIVE PROGRAM

CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - J.C. GREGORY  
OI - P.N. PETERS

U OF ALABAMA  
NASA-MSFC

BRIEF DESCRIPTION

THE MAIN OBJECTIVE OF THIS EXPERIMENT IS TO DETERMINE WHAT EFFECTS FROM THE IMPINGEMENT OF HIGH FLUXES OF ATOMIC OXYGEN ON VARIOUS SOLID SURFACES ARE MEASURABLE AND TO INVESTIGATE THE MECHANISMS OF INTERACTION. THIS IS ACCOMPLISHED BY USING A WIDE VARIETY OF MATERIALS, SOME NOT CHEMICALLY AFFECTED BY OXYGEN, AND ALTERING THE EXPOSURE, ANGLE OF INCIDENCE, AND TEMPERATURE OF THE SUBSTRATES BY THEIR POSITION ON THE LDEF SPACECRAFT AND BY EXPERIMENT DESIGN.

----- SPACE SHUTTLE LDEF-A, GRUBER -----

INVESTIGATION NAME- SPACE POWER EXPERIMENT

NSSDC ID- SSLDEF -11      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - R.P. GRUBER \*  
OI - J.C. KOLECKI

NASA-LARC  
NASA-LERC

BRIEF DESCRIPTION

THIS EXPERIMENT DEMONSTRATES A LOW-COST APPROACH USING COMMERCIALLY AVAILABLE HARDWARE FOR SPACE POWER APPLICATIONS LESS THAN 100 WATTS, AND OFFERS THE POTENTIAL FOR SIGNIFICANT SAVINGS IN FUTURE POWER SYSTEMS.

----- SPACE SHUTTLE LDEF-A, HANKS -----

INVESTIGATION NAME- SHUTTLE BAY ENVIRONMENT MEASUREMENTS

NSSDC ID- SSLDEF -29      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - B.R. HANKS  
OI - J.P. YOUNG  
OI - F.J. ON

NASA-LARC  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

THIS EXPERIMENT WILL MEASURE THE ACOUSTIC, DYNAMIC, PRESSURE AND THERMAL ENVIRONMENTS A LARGE HEAVY PAYLOAD WILL EXPERIENCE IN THE SHUTTLE BAY DURING LAUNCH AND RE-ENTRY.

----- SPACE SHUTTLE LDEF-A, HICKEY -----

INVESTIGATION NAME- PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS

NSSDC ID- SSLDEF -27      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - J.R. HICKEY  
OI - F.J. GRIFFIN

EPPELEY LAB, INC  
EPPELEY LAB, INC

BRIEF DESCRIPTION

EARTH RADIATION BUDGET (ERB) EXPERIMENTS REQUIRE ACCURACIES IN SOLAR AND EARTH FLUX RADIATION MEASUREMENTS IN FRACTIONAL PERCENTAGES. THIS EXPERIMENT EXPOSES ERB CHANNEL COMPONENTS, THEN RETRIEVES AND RESUBMITS THEM TO RADIOMETRIC CALIBRATION. CORRECTIONS ARE APPLIED TO ERB RESULTS. INFORMATION IS OBTAINED TO HELP SELECT COMPONENTS FOR FUTURE SOLAR AND ERB EXPERIMENTS.

----- SPACE SHUTTLE LDEF-A, HORZ -----

INVESTIGATION NAME- CHEMISTRY OF MICROMETEOROIDS

NSSDC ID- SSLDEF -51      INVESTIGATIVE PROGRAM  
CODE SL

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST

PERSONNEL

PI - F. HORZ  
OI - D.S. MCKAY  
OI - D.A. MORRISON  
OI - D.E. BROWNLIE  
OI - R.M. HOUSLEY

NASA-JSC  
NASA-JSC  
NASA-JSC  
U OF WASHINGTON  
ROCKWELL INTL CORP

BRIEF DESCRIPTION

THE OBJECTIVE OF THE EXPERIMENT IS TO OBTAIN CHEMICAL ANALYSIS OF A STATISTICALLY SIGNIFICANT NUMBER OF MICROMETEOROIDS. INFORMATION REGARDING THEIR DENSITY, SHAPE, AND MASS FLUX IS ALSO OBTAINED.

----- SPACE SHUTTLE LDEF-A, HUMES -----

INVESTIGATION NAME- SPACE DEBRIS IMPACT STUDY

NSSDC ID- SSLDEF -36      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - P.H. HUMES

NASA-LARC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO DETERMINE THE TYPE AND DEGREE OF DAMAGE WHICH IS EXPECTED FROM METEOROID IMPACTS ON EXPOSED TARGETS OF SEVERAL DIFFERENT CONFIGURATIONS. THESE DATA SHOULD HELP IN THE DESIGN OF FUTURE SPACECRAFT WHICH BECAUSE OF THEIR SIZES AND EXPECTED LIFETIMES, WOULD OTHERWISE HAVE HIGH PROBABILITIES OF DAMAGE CAUSED BY METEOROID IMPACTS.

----- SPACE SHUTTLE LDEF-A, JOHNSTON -----

INVESTIGATION NAME- FIBER OPTICS EXPERIMENT

NSSDC ID- SSLDEF -03      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - A.R. JOHNSTON

NASA-JPL

BRIEF DESCRIPTION

THIS EXPERIMENT DETERMINES LONG-TERM DEGRADATION OF FIBER OPTIC DATA TRANSMISSION EQUIPMENT AND QUALIFIES DESIGNS FOR MOUNTING TECHNIQUES, TERMINAL COUPLING, AND SHEATHS. FIBER OPTIC TRANSMISSION LINES ARE REQUIRED FOR FUTURE SATELLITES BECAUSE OF THEIR LARGE BANDWIDTHS, LACK OF ELECTROMAGNETIC INTERFERENCE PROBLEMS, LOW WEIGHT AND COST, AND SAFETY.

----- SPACE SHUTTLE LDEF-A, LAVOI -----

INVESTIGATION NAME- LARGE SPACE STRUCTURE LIGHTING EVALUATION

NSSDC ID- SSLDEF -07      INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - P.A. LAVOI  
OI - E.J. REINBOLD

ILC TECHNOLOGY INC  
NASA-MSFC

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO OBTAIN DATA WHICH PROVIDE A BASIS TO CONFIDENTLY SELECT LIGHTS FOR FUTURE LONG-DURATION SPACE APPLICATIONS, SUCH AS LARGE SPACE STRUCTURES. PRESENT STATE-OF-THE-ART LIGHTS ARE PLACED IN THE SPACE ENVIRONMENT WITH APPROPRIATE INSTRUMENTATION. A BASIC KNOWLEDGE OF THE OPERATION OF CONFINED PLASMA WITHOUT MODIFICATION BY CONVECTION WILL LEAD TO SIGNIFICANTLY IMPROVED LAMPS DESIGNED FOR TERRESTRIAL USE.

----- SPACE SHUTTLE LDEF-A, LIND -----

INVESTIGATION NAME- GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY

NSSDC ID- SSLDEF -17      INVESTIGATIVE PROGRAM  
CODE RS/CO-OP

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - R.D. LIND  
OI - K.F. NIELSEN

ROCKWELL INT'L SCI CTR  
TECH U OF BERNE

BRIEF DESCRIPTION

THIS EXPERIMENT DEVELOPS A NOVEL METHOD FOR GROWING CRYSTALS FROM SOLUTIONS. THIS METHOD CONSISTS OF ALLOWING TWO OR MORE REACTANT SOLUTIONS TO DIFFUSE SLOWLY TOWARDS EACH OTHER IN A REGION OF PURE SOLVENT IN WHICH THEY REACT TO FORM SINGLE CRYSTALS OF A DESIRED SUBSTANCE. SEVERAL CRYSTALS OF IMPORTANCE IN RESEARCH AND TECHNOLOGY ARE OF INTEREST.

----- SPACE SHUTTLE LDEF-A, LIND -----

INVESTIGATION NAME- INTERSTELLAR GAS

NSSDC ID- SSLDEF -48      INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - D.L. LIND  
OI - J. GEISS  
OI - F. BUHLER

NASA-JSC  
U OF BERNE  
U OF BERNE

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO ANALYZE THE INTERSTELLAR NOBLE GAS ATOMS WHICH PENETRATE THE HELIOSPHERE TO THE VICINITY OF THE EARTH. BY COLLECTING THESE PARTICLES AT SEVERAL LOCATIONS IN THE EARTH'S ORBIT, IT IS POSSIBLE TO STUDY THE DYNAMICS OF THE INTERSTELLAR WIND AS IT FLOWS THROUGH THE HELIOSPHERE AND INTERACTS WITH THE SOLAR PHOTON FLUX AND SOLAR WIND. THE EXPERIMENT ALSO INVESTIGATES CHARACTERISTICS OF THE INTERSTELLAR MEDIUM OUTSIDE THE REGION OF THE SOLAR SYSTEM.

----- SPACE SHUTTLE LDEF-A, MALHERBE -----

INVESTIGATION NAME- VACUUM DEPOSITED OPTICAL COATINGS

NSSDC ID- SSLDEF -41

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - A. MALHERBE

MATRA/SFOM OPTICAL DIV

BRIEF DESCRIPTION

THIS EXPERIMENT IS DESIGNED TO INVESTIGATE THE LONG-TERM STABILITY OF A WIDE RANGE OF VACUUM DEPOSITED OPTICAL COATINGS WHICH ARE USED IN SPACECRAFT OPTICAL AND ELECTRO-OPTICAL INSTRUMENTS.

----- SPACE SHUTTLE LDEF-A, MANDEVILLE -----

INVESTIGATION NAME- STUDY OF METEOROIDS IMPACT CRATERS ON VARIOUS MATERIAL

NSSDC ID- SSLDEF -32

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST

PERSONNEL

PI - J.C. MANDEVILLE

CERT/ONERA

BRIEF DESCRIPTION

THE MAIN GOAL OF THIS EXPERIMENT IS TO STUDY IMPACT MICROCRATERS PRODUCED BY MICROMeteor IMPACTS ON SELECTED MATERIALS (METALS, GLASSES, MINERALS) IN THE FORM OF THICK TARGETS. INTERPLANETARY DUST PARTICLES ARE EXPECTED TO FORM WELL-DEFINED CRATERS UPON IMPACTING THE EXPOSED MATERIALS AT VERY HIGH VELOCITY. THE STUDY OF CRATER FREQUENCY AND IMPACT FEATURES PRIMARILY GIVES DATA ON MASS-FUX DISTRIBUTION OF MICROMETEOROIDS, AND TO A LESSER EXTENT PROVIDES VELOCITY MAGNITUDE AND DIRECTION.

----- SPACE SHUTTLE LDEF-A, MANDEVILLE -----

INVESTIGATION NAME- DUST DEBRIS COLLECTION WITH STACKED DETECTORS

NSSDC ID- SSLDEF -33

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY  
DUST

PERSONNEL

PI - J.C. MANDEVILLE

CERT/ONERA

BRIEF DESCRIPTION

THE AIM OF THIS EXPERIMENT IS TO INVESTIGATE, PRIMARILY, THE FEASIBILITY FOR FUTURE MISSIONS OF MULTILAYER THIN FILM DETECTORS ACTING AS ENERGY SORTERS IN ORDER TO COLLECT MICROMETEOROIDS, IF NOT IN THEIR ORIGINAL SHAPE, AT LEAST AS FRAGMENTS SUITABLE FOR CHEMICAL ANALYSIS.

----- SPACE SHUTTLE LDEF-A, MCDONNELL -----

INVESTIGATION NAME- MULTIPLE FOIL MICROABRASION PACKAGE

NSSDC ID- SSLDEF -31

INVESTIGATIVE PROGRAM  
CODE SL/CO-OP

INVESTIGATION DISCIPLINE(S)  
INTERPLANETARY DUST

PERSONNEL

PI - J.A.M. MCDONNELL  
OI - D.G. ASHWORTH  
OI - W.C. CAREY  
OI - R.P. FLAVILL  
OI - R.C. JENNISON

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BRIEF DESCRIPTION

THIS EXPERIMENT EVALUATES THE NEAR-EARTH PICO-PARTICLE ENVIRONMENT BY PENETRATION OF MICROMETER THICKNESS MULTIPLE-FOIL ARRAYS. RELIABLE DEFINITION OF THE SIZE, VELOCITY AND DISTRIBUTION OF THE NEAR-EARTH SOLID PARTICLE ENVIRONMENT AND PARTICLE COMPOSITION ANALYSIS SUPERSEDES RESULTS OBTAINED FROM OTHER RELATED PASSIVE EXPERIMENTS.

----- SPACE SHUTTLE LDEF-A, MCINTOSH, JR. -----

INVESTIGATION NAME- LOW TEMPERATURE HEAT PIPE EXPERIMENT

NSSDC ID- SSLDEF -12

INVESTIGATIVE PROGRAM

CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - R. MCINTOSH, JR.  
OI - S. OLLENDORF  
OI - C.R. MCCREIGHT

NASA-GSFC  
NASA-GSFC  
NASA-ARC

BRIEF DESCRIPTION

THIS EXPERIMENT EVALUATES THE PERFORMANCE CHARACTERISTICS IN THE SPACE ENVIRONMENT OF A FIXED CONDUCTANCE TRANSPORTER HEAT PIPE, A THERMAL DIODE HEAT PIPE, AND A LOW-TEMPERATURE PHASE CHANGE MATERIAL.

----- SPACE SHUTTLE LDEF-A, MILLER -----

INVESTIGATION NAME- INDUCED ENVIRONMENT CONTAMINATION MONITOR

NSSDC ID- SSLDEF -30

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - E.B. MILLER  
OI - J.A. FOUNTAIN  
OI - R.C. LINTON

NASA-MSFC  
NASA-MSFC  
NASA-MSFC

BRIEF DESCRIPTION

THIS EXPERIMENT MEASURES THE MOLECULAR AND PARTICULATE CONTAMINATION A MASSIVE PAYLOAD EXPERIENCES IN THE SHUTTLE BAY DURING THE ORBITAL PERIOD, AND POSSIBLE PLUME IMPINGEMENT DURING DEPLOYMENT OPERATIONS.

----- SPACE SHUTTLE LDEF-A, NICHOLS -----

INVESTIGATION NAME- EFFECTS OF SOLAR RADIATION ON GLASSES

NSSDC ID- SSLDEF -44

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - R.L. NICHOLS  
OI - D.L. KINSER

NASA-MSFC  
VANDERBILT U

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS EXPERIMENT IS TO DETERMINE THE EFFECTS OF SOLAR RADIATION AND THE SPACE ENVIRONMENT ON THE OPTICAL, MECHANICAL, AND CHEMICAL PROPERTIES OF VARIOUS GLASSES.

----- SPACE SHUTTLE LDEF-A, O'SULLIVAN -----

INVESTIGATION NAME- HIGH RESOLUTION STUDY OF ULTRA HEAVY COSMIC RAYS

NSSDC ID- SSLDEF -49

INVESTIGATIVE PROGRAM  
SCIENCE

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS

PERSONNEL

PI - D. O'SULLIVAN  
OI - C.O. CEALLAIGH  
OI - A. THOMPSON  
OI - K.P. WENZEL  
OI - V. DOMINGO

DUBLIN INST ADV STUDY  
DUBLIN INST ADV STUDY  
DUBLIN INST ADV STUDY  
ESA-ESTEC  
ESA-ESTEC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO STUDY CHARGE AND ENERGY SPECTRA OF COSMIC RAY NUCLEI, SUPER HEAVY NUCLEI, AND HEAVY ANTINUCLEI. THE INFORMATION PROVIDED ASSISTS IN UNDERSTANDING THE PHYSICAL PROCESSES OF COSMIC RAY NUCLEI PRODUCTION AND ACCELERATION AT THE SOURCE IN INTERSTELLAR SPACE. INFORMATION CONCERNING NUCLEOSYNTHESIS IS ALSO OBTAINED.

----- SPACE SHUTTLE LDEF-A, PAILOUS -----

INVESTIGATION NAME- THERMAL COATINGS AND STRUCTURAL MATERIAL

NSSDC ID- SSLDEF -34

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - A. PAILOUS  
OI - J.C. GUILLAUMON

CERT/ONERA  
CNES/CST

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT IS TO EXAMINE THE VALIDITY OF GROUND SIMULATIONS OF THE SPACE ENVIRONMENT FOR STUDIES OF DEGRADATION OF THERMAL CONTROL COATINGS USED ON SATELLITES. COMPARISON IS MADE OF SAMPLE DEGRADATIONS FROM BOTH GROUND TESTS AND ACTUAL FLIGHT TESTS.

**----- SPACE SHUTTLE LDEF-A, POWELL-----**

**INVESTIGATION NAME-** GRAPHITE/POLYIMIDE AND GRAPHITE/EPOXY MECHANICAL PROPERTIES IN SPACE

NSSDC ID- SSLDEF -35

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - J.W. POWELL  
OI - D.W. WELCH

ROCKWELL INT'L CORP  
ROCKWELL INT'L CORP

**BRIEF DESCRIPTION**

THE PRIMARY OBJECTIVE OF GRAPHITE/POLYIMIDE TESTING IS TO ACCUMULATE ACTUAL OPERATIONAL DATA IN THE SPACE ENVIRONMENT OVER LONG PERIODS OF TIME. FROM THESE DATA, DESIGN CRITERIA ASSOCIATED WITH MECHANICAL PROPERTIES OF FUTURE LIGHTWEIGHT SPACE-ORIENTED STRUCTURAL COMPONENTS ARE ESTABLISHED. THE PRIMARY OBJECTIVE OF THE GRAPHITE/EPOXY SANDWICH TESTING IS TO ACCUMULATE ACTUAL OPERATIONAL DATA ASSOCIATED WITH LONG DURATION ORBITAL EXPOSURE AND TO VALIDATE MECHANICAL PROPERTIES KNOCK DOWN FACTORS AS APPLIED TO THE DESIGN/ANALYSIS OF THE EXISTING SPACE SHUTTLE GRAPHITE/EPOXY PAYLOAD BAY DOOR.

**----- SPACE SHUTTLE LDEF-A, PREUSS-----**

**INVESTIGATION NAME-** CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS

NSSDC ID- SSLDEF -46

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - L. PREUSS

MBB SPACE DIV

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT IS TO INVESTIGATE THE COMBINED EFFECTS OF RADIATION AND CONTAMINATION ON DIFFERENT THERMAL COATINGS AND SOLAR CELLS WITH AND WITHOUT CONDUCTIVE LAYERS TO PROVIDE DESIGN CRITERIA, TECHNIQUES AND TEST METHODS TO ENSURE CONTROL OF COMBINED SPACE AND SPACECRAFT ENVIRONMENTAL EFFECTS. THIS EXPERIMENT ALSO PROVIDES QUALIFICATIONS FOR A NUMBER OF NEW COATINGS AND SOLAR CELLS.

**----- SPACE SHUTTLE LDEF-A, RAND-----**

**INVESTIGATION NAME-** BALLOON MATERIALS DEGRADATION

NSSDC ID- SSLDEF -38

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - J.L. RAND

TEXAS A&M

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT IS TO ASSESS THE EFFECTS OF LONG-TERM EXPOSURE OF CANDIDATE BALLOON FILMS, TAPES, AND LINES TO THE SPACE ENVIRONMENT. DEGRADATION OF MECHANICAL AND RADIOMETRIC PROPERTIES IS OBSERVED BY A SERIES OF TESTS ON THE EXPOSED MATERIALS.

**----- SPACE SHUTTLE LDEF-A, ROBERTSON-----**

**INVESTIGATION NAME-** EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED DETECTORS

NSSDC ID- SSLDEF -18

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - J.P. ROBERTSON  
OI - I.O. CLARK  
OI - R.K. CROUCH

NASA-LARC  
NASA-LARC  
NASA-LARC

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS EXPERIMENT IS TO DETERMINE THE EFFECT OF LONG DURATION SPACE EXPOSURE AND LAUNCH ENVIRONMENT ON THE PERFORMANCE OF PYROELECTRIC DETECTORS. PERFORMANCE PARAMETERS (RESPONSIVITY, DETECTIVITY, AND SPECTRAL RESPONSE) AND MATERIALS PROPERTIES (PYROELECTRIC COEFFICIENT AND DIELECTRIC LOSS TANGENT) ARE MEASURED BEFORE AND AFTER EXPOSURE.

**----- SPACE SHUTTLE LDEF-A, ROBINSON, JR.-----**

**INVESTIGATION NAME-** TRANSVERSE FLAT PLATE HEAT PIPE PERFORMANCE

NSSDC ID- SSLDEF -37

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - G.A. ROBINSON, JR.  
OI - F. EDELSTEIN

NASA-MSC  
GRUMMAN AEROSPACE CORP

**BRIEF DESCRIPTION**

THE PURPOSE OF THIS EXPERIMENT IS TO DEMONSTRATE THE LONG-TERM OPERATION OF A HIGH-CAPACITY LIGHTWEIGHT HEAT PIPE IN A SUSTAINED ZERO-GRAVITY ENVIRONMENT. THE EXPERIMENT ALSO TESTS THE ABILITY OF THE HEAT PIPE TO REPRIME IN ZERO GRAVITY.

**----- SPACE SHUTTLE LDEF-A, SCHALL-----**

**INVESTIGATION NAME-** SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS

NSSDC ID- SSLDEF -15

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - P. SCHALL  
OI - E.N. BOBSON  
OI - M.F. AMATEAU

AEROSPACE CORP  
AEROSPACE CORP  
AEROSPACE CORP

**BRIEF DESCRIPTION**

MATERIALS SPECIMENS ARE ANALYZED TO UNDERSTAND CHANGES IN PROPERTIES AND STRUCTURE AFTER EXPOSURE TO SPACE ENVIRONMENT. THE EXPERIMENT WILL INCLUDE THE INVESTIGATION OF VARIOUS STRUCTURAL MATERIALS, SOLAR POWER COMPONENTS, THERMAL CONTROL MATERIALS, LASER COMMUNICATION COMPONENTS, LASER MINOR COATINGS, LASER-HARDENED MATERIALS, ANTENNA MATERIALS, AND ADVANCED COMPOSITES.

**----- SPACE SHUTTLE LDEF-A, SCOTT, JR.-----**

**INVESTIGATION NAME-** ATOMIC OXYGEN STIMULATED OUTGASSING

NSSDC ID- SSLDEF -07

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - R.L. SCOTT, JR.  
OI - R.C. LINTON

SOUTHERN U  
NASA-MSC

**BRIEF DESCRIPTION**

THE EFFECT OF OXYGEN IMPINGEMENT ON THERMAL CONTROL SURFACE IN NEAR-EARTH ORBIT IS INVESTIGATED WITH REGARD TO THE PRODUCTION OF OPTICALLY DAMAGING OUTGASSING PRODUCTS. THE BIDIRECTIONAL REFLECTANCE OF SELECTED COATINGS IS MEASURED BEFORE AND AFTER SPACE EXPOSURE. DATA HELP DETERMINE IF ATOMIC OXYGEN IMPINGEMENT WAS A MAJOR FACTOR IN UNEXPLAINED SKYLAB CONTAMINATION BY PROVIDING AN UNDERSTANDING OF THE EFFECT OF ATOMIC OXYGEN ON THERMAL CONTROL SURFACES.

**----- SPACE SHUTTLE LDEF-A, SEELEY-----**

**INVESTIGATION NAME-** HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS-RADIATION EFFECTS

NSSDC ID- SSLDEF -23

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - J.S. SEELEY  
OI - A. WHATLEY  
OI - R. HUNNEMAN

READING U  
READING U  
READING U

**BRIEF DESCRIPTION**

THIS EXPERIMENT IS DESIGNED TO EXPOSE TO THE SPACE ENVIRONMENT INFRARED MULTILAYER INTERFERENCE FILTERS OF NOVEL DESIGN, CONSTRUCTION, AND MANUFACTURE, WHICH ARE USEFUL IN SENSING ATMOSPHERIC TEMPERATURE AND COMPOSITION. OPTICAL BEHAVIOR OF THESE FILTERS UNDER RADIATION IS NOT KNOWN AND IS CRITICAL TO THEIR PERFORMANCE.

**----- SPACE SHUTTLE LDEF-A, SELLEN, JR.-----**

**INVESTIGATION NAME-** SPACE PLASMA-HIGH VOLTAGE DRAINAGE

ORIGINAL PAGE IS  
OF POOR QUALITY

NSSDC ID- SSLDEF -09 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - J.H. SELLER, JR.  
TRW SYSTEMS GROUP

BRIEF DESCRIPTION  
THIS EXPERIMENT IS FLOWN TO DETERMINE THE LONG-TERM CURRENT BRAIDAGE PROPERTIES OF THIN DIELECTRIC FILMS SUBJECTED TO HIGH-LEVEL ELECTRIC STRESS IN THE PRESENCE OF THE AMBIENT PLASMA AND SOLAR RADIATION. OBSERVED BEHAVIOR OF THESE FILMS WILL ESTABLISH ALLOWABLE LONG-TERM ELECTRIC STRESS LEVELS FOR SUCH FILMS, AS APPLIED TO SOLAR ARRAY AND SPACECRAFT THERMAL CONTROL COATING MATERIALS.

----- SPACE SHUTTLE LDEF-A, SHAPIRO-----

INVESTIGATION NAME- HEAVY IONS IN SPACE

NSSDC ID- SSLDEF -13 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL  
PI - M.M. SHAPIRO  
OI - F.W. O'DELL  
OI - R. SILBERBERG  
OI - C.H. TSAO  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION  
A STACK OF PASSIVE TRACK DETECTORS, INTERLEAVED WITH HEAVY METAL LAYERS, IS USED TO INVESTIGATE THE THREE COMPONENTS OF HEAVY NUCLEI IN SPACE (LOW-ENERGY NUCLEI  $n$ ,  $o$ ,  $\alpha$ , THE HEAVY NUCLEI OF THE VAN ALLEN BELTS, AND THE ULTRA-HEAVY NUCLEI,  $Z \geq 30$ , OF THE GALACTIC COSMIC RADIATION).

----- SPACE SHUTTLE LDEF-A, SLEMP-----

INVESTIGATION NAME- THERMAL CONTROL SURFACES(PASSIVE)

NSSDC ID- SSLDEF -05 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - W.S. SLEMP  
OI - R.A. BABCOCK, 3RD  
NASA-LARC  
NASA-LARC

BRIEF DESCRIPTION  
THIS EXPERIMENT DETERMINES THE EFFECTS OF SPACE EXPOSURE TO NEW COATINGS BEING DEVELOPED FOR SPACECRAFT THERMAL CONTROL. SAMPLES OF PAINTS, OTHER COATINGS AND SECOND-SURFACE MIRRORS ARE EXPOSED, SOME TO ALL ENVIRONMENTS OF THE MISSION AND SOME TO ONLY SPECIFIC ENVIRONMENTS. SPECTRAL REFLECTANCE OF THE SAMPLES IS MEASURED BEFORE AND AFTER THE MISSION.

----- SPACE SHUTTLE LDEF-A, SLEMP-----

INVESTIGATION NAME- SPACE EXPOSURE OF MATERIALS FOR ADVANCED SPACECRAFT

NSSDC ID- SSLDEF -21 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - W.S. SLEMP  
NASA-LARC

BRIEF DESCRIPTION  
THE OBJECTIVE OF THIS EXPERIMENT IS TO EVALUATE THE EFFECTS OF THE NEAR-EARTH ORBITAL ENVIRONMENT ON THE PHYSICAL AND CHEMICAL PROPERTIES OF COMPOSITE MATERIALS.

----- SPACE SHUTTLE LDEF-A, TAYLOR-----

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS ON FIBER OPTIC SYSTEMS

NSSDC ID- SSLDEF -16 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - E.W. TAYLOR  
USAF WEAPONS LAB

BRIEF DESCRIPTION  
THE OBJECTIVE OF THIS INVESTIGATION IS TO QUALIFY FIBER OPTIC LINKS FOR FUTURE SPACE APPLICATIONS, AND TO DOCUMENT AND ANALYZE THE EFFECT OF THE NATURAL SPACE ENVIRONMENT ON LINK AND COMPONENT PERFORMANCE.

----- SPACE SHUTTLE LDEF-A, TENNYSON-----

INVESTIGATION NAME- PROPERTIES OF POLYMER MATRIX COMPOSITE MATERIALS, EFFECT OF SPACE ENVIRONMENT

NSSDC ID- SSLDEF -24 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - R.C. TENNYSON  
OI - J.S. HANSEN  
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U OF TORONTO

BRIEF DESCRIPTION  
BY VARYING THE TIMES OF EXPOSURE TO THE SPACE ENVIRONMENTS, THE CHANGES IN THE MECHANICAL PROPERTIES OF SEVERAL LIGHTWEIGHT COMPOSITE MATERIALS, INCLUDING GRAPHITE, BORON, S-GLASS, AND PRD-49 ARE STUDIED. PROPERTY DEGRADATION CAUSED BY MATRIX BREAKDOWN, OUTGASSING, THERMAL STRESSES, AND INTERNAL VOID CRACKS MUST BE KNOWN ABOUT THESE MATERIALS. ACTUAL SPECIMEN TEST RESULTS FROM SPACE ARE CORRELATED WITH GROUND TEST DATA AT AMBIENT CONDITIONS AND IN A THERMAL-VACUUM CHAMBER.

----- SPACE SHUTTLE LDEF-A, VENABLES-----

INVESTIGATION NAME- RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS EXPERIMENT

NSSDC ID- SSLDEF -22 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - J.D. VENABLES  
OI - J.S. AHEARN  
MARTIN-MARIETTA LABS  
MARTIN-MARIETTA LABS

BRIEF DESCRIPTION  
THIS EXPERIMENT OBTAINS INFORMATION ON PREDICTING AND IMPROVING THE RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS. THE EFFECTS OF EXPOSURE TO AN ORBITAL RADIATION ENVIRONMENT ARE COMPARED WITH RESULTS USING A TRANSMISSION ELECTRON MICROSCOPE. RADIATION-INDUCED FREQUENCY DRIFTS AND ACOUSTIC ABSORPTION IN THESE OSCILLATORS MUST BE MINIMIZED TO AVOID UNDESIRABLE VARIATIONS IN HIGH-PRECISION CLOCKS IN SATELLITES AND MISSILES. DATA OBTAINED FROM LDEF AND GROUND EXPERIMENTS PROVIDE GUIDES TO IMPROVE THE RADIATION HARDNESS OF THESE COMPONENTS.

----- SPACE SHUTTLE LDEF-A, WHITAKER-----

INVESTIGATION NAME- SOLAR ARRAY MATERIALS (PASSIVE)

NSSDC ID- SSLDEF -45 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - A.F. WHITAKER  
OI - C.F. SMITH, JR.  
OI - L.E. YOUNG  
OI - H.M. BRANDHORST, JR.  
OI - A.F. FORESTIERI  
OI - E.N. COSTOGUE  
OI - E.M. GADDY  
OI - J.A. BASS  
NASA-MSFC  
NASA-MSFC  
NASA-MSFC  
NASA-LERC  
NASA-LERC  
NASA-JPL  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION  
THIS EXPERIMENT DETERMINES THE EFFECTS OF SPACE ON MECHANICAL, ELECTRICAL, AND OPTICAL PROPERTIES OF CANDIDATE LIGHTWEIGHT SOLAR ARRAY MATERIALS SUCH AS THOSE NEEDED FOR A SPACE STATION, A SATELLITE POWER STATION, AND SOLAR ELECTRIC PROPULSION SOLAR ARRAYS. DATA OBTAINED ON THE COMBINED EFFECTS OF ULTRAVIOLET, PENETRATING RADIATION AND VACUUM ON THESE MATERIAL PROPERTIES ALLOW SPACECRAFT MANUFACTURERS TO DESIGN SOLAR ARRAYS WITH MORE PREDICTABLE LIFETIMES.

----- SPACE SHUTTLE LDEF-A, WILKES-----

INVESTIGATION NAME- THERMAL CONTROL SURFACES

NSSDC ID- SSLDEF -04 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - D.R. WILKES  
OI - H.M. KING  
NASA-MSFC  
NASA-MSFC



----- SPACELAB 1, BENTON -----

INVESTIGATION NAME- HZE-PARTICLE DOSIMETRY

NSSDC ID- SPALAB1-11

INVESTIGATIVE PROGRAM  
CODE SB

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
SPACE BIOLOGY

PERSONNEL

PI - E.V. BENTON U OF CALIF., SAN FRANC.  
OI - D.B. PETERSON U OF CALIF., SAN FRANC.  
OI - R.M. CASSOU U OF CALIF., SAN FRANC.

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS EXPERIMENT ARE TO PROVIDE BASELINE DATA FOR EVALUATION OF RADIATION RISK TO MAN FROM HIGH CHARGE AND ENERGY (HZE) PARTICLES ON THIS AND FUTURE SPACELAB MISSIONS, AND TO CONTINUE A PROGRAM OF DOCUMENTATION OF HZE PARTICLE RADIATION INSIDE MANNED SPACECRAFT WHICH HAS INCLUDED APOLLO, SKYLAB, AND ASTP MISSIONS. THE EQUIPMENT CONSISTS OF: (1) A PASSIVE DOSIMETER PACKET CONTAINING PLASTIC NUCLEAR TRACK DETECTORS, AN AGCL CRYSTAL DETECTOR, AND THERMOLUMINESCENT DETECTOR CHIPS; AND (2) A THICK PLASTIC STACK CONSISTING OF 200 LEXAN POLYCARBONATE PLASTIC FILMS.

----- SPACELAB 1, BERTAUX -----

INVESTIGATION NAME- INVESTIGATION ON ATMOSPHERIC H AND D  
THROUGH THE MEASUREMENT OF LYMAN-ALPHA

NSSDC ID- SPALAB1-22

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - J.L. BERTAUX CNRS-SA  
OI - G. KOCKARTS IASB

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE: TO USE A LYMAN-ALPHA PHOTOMETER EQUIPPED WITH H AND D ABSORPTION CELLS TO MEASURE DEUTERIUM EMISSIONS; TO OBSERVE PROTON PRECIPITATION IN THE AURORAL AND EQUATORIAL ZONES; TO USE A HYDROGEN ABSORPTION CELL AS A TECHNIQUE TO ELIMINATE THE INTERPLANETARY LYMAN-ALPHA BACKGROUNDS; TO OBSERVE THE SEPAC PROTON GUN INTERACTION WITH THE STS/SPACELAB ENVIRONMENTS; AND TO ATTEMPT TO MEASURE ATMOSPHERIC HYDROGEN LYMAN-ALPHA EMISSIONS. THE EQUIPMENT CONSISTS OF A SPECTROPHOTOMETER WITH AN ATOMIC HYDROGEN ABSORPTION CELL AND AN ATOMIC DEUTERIUM ABSORPTION CELL, AND A SOLAR BLIND PHOTOMULTIPLIER FOR DETECTOR.

----- SPACELAB 1, BOWYER -----

INVESTIGATION NAME- FAR UV OBSERVATIONS USING THE FAUST  
INSTRUMENT

NSSDC ID- SPALAB1-07

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - C.S. BOWYER U OF CALIF., BERKELEY  
OI - G.C. COURTES CNRS-LAS  
OI - J.M. DEHARVENG CNRS-LAS  
OI - R. MALINA U OF CALIF., BERKELEY

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO PERFORM UV (1100-3500 Å) BROADBAND IMAGING AND LOW-RESOLUTION (20-200 Å) SPECTROSCOPY OF GLOBULAR CLUSTERS, GALACTIC CLUSTERS, QUASI-STELLAR OBJECTS, NEARBY GALAXIES, UV STARS, EXTENDED SOURCES, GEOCORONA, AND SPACELAB 1 CONTAMINANTS. THE EQUIPMENT CONSISTS OF A FAR ULTRAVIOLET SPACE TELESCOPE (FAUST) AND AN ELECTRONIC INTERFACE MODULE. THE INSTRUMENT IS AN F/1.12 WYNNE CAMERA WITH AN EFFECTIVE COLLECTING AREA OF 150 SQ CM AND A FIELD-OF-VIEW OF 7.5 DEG. THE IMAGING CAPABILITY IS BETTER THAN 2 ARC MINUTES IN THE ENTIRE FIELD-OF-VIEW. THE DETECTOR SYSTEM USES A MICROCHANNEL PLATE IMAGE INTENSIFIER IN CONJUNCTION WITH A 60-EXPOSURE, 35 MILLIMETER FILM PACK OF KODAK 103AO.

----- SPACELAB 1, BROWN -----

INVESTIGATION NAME- NUTATION OF HELIANTHUS ANNUUS

NSSDC ID- SPALAB1-12

INVESTIGATIVE PROGRAM  
CODE SB

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - A.H. BROWN  
OI - A.O. DAHL  
OI - D.K. CHAPMAN

U OF PENNSYLVANIA  
U OF PENNSYLVANIA  
U OF PENNSYLVANIA

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO: (1) DETERMINE QUANTITATIVELY WHETHER THE CONDITION OF SUSTAINED WEIGHTLESSNESS PRODUCES THE SAME DAMPING OR INHIBITING EFFECT ON PLANT NUTATION AS DOES ROTATION ON A HORIZONTAL CLINOSTAT ON EARTH; (2) MEASURE THE PERIOD AND AMPLITUDE OF ANY NUTATIONAL OSCILLATIONS BY THE SEEDLINGS WHICH MAY BE OBSERVED UNDER THE CONDITIONS OF SUSTAINED WEIGHTLESSNESS; AND (3) GAIN EXPERIENCE IN THE CONDUCT OF A PLANT PHYSIOLOGICAL EXPERIMENT IN A MULTIDISCIPLINARY SPACE LABORATORY IN WHICH DIVERSE FACILITIES ARE TO BE SHARED. THE EQUIPMENT CONSISTS OF -- DARK BOX, WITHIN WHICH FOUR TEST PLANTS ILLUMINATED BY INFRARED LIGHT ARE LOCATED IN THE FIELD OF VIEW OF A VIDEO CAMERA, ROTOR COMPARTMENTS, PLANT MODULES, BATTERY PACK, VIDEO TAPE DATA RECORDER, CONTROL ELECTRONICS, AND A CARRY-ON MODULE CONTAINER OF 28 PLANT MODULES.

----- SPACELAB 1, BUCKER -----

INVESTIGATION NAME- ADVANCED BIOSTACK EXPERIMENT

NSSDC ID- SPALAB1-32

INVESTIGATIVE PROGRAM  
CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - H. BUCKER

DFVLR

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO DETERMINE THE BIOLOGICAL IMPORTANCE OF NUCLEAR DISINTEGRATION STARS, TO ASSESS QUANTITATIVELY THE INTERFERENCE OF HZE PARTICLES WITH OTHER BIOLOGICAL STUDIES IN SPACE, TO DETERMINE THE DISTRIBUTION OF HZE PARTICLES AT DIFFERENT LOCATIONS IN THE MODULE AND ON THE PALLET, AND ESTABLISH RADIATION PROTECTION GUIDELINES FOR MAN AND BIOLOGICAL EXPERIMENTS IN FUTURE SPACE FLIGHTS. THE EQUIPMENT CONSISTS OF FOUR CYLINDERS WITH LAYERS OF DIFFERENT BIOLOGICAL OBJECTS BETWEEN DIFFERENT TRACK DETECTORS, INTEGRATING DOSIMETERS, AND SPECIALLY SELECTED TRACK DETECTORS.

----- SPACELAB 1, COGOLI -----

INVESTIGATION NAME- LYMPHOCYTE PROLIFERATION IN  
WEIGHTLESSNESS

NSSDC ID- SPALAB1-36

INVESTIGATIVE PROGRAM  
CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - A. COGOLI

U OF ZURICH

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO GAIN FURTHER INFORMATION ON THE TRIGGERING OF THE IMMUNORESPONSE AND ON THE MECHANISM OF EUKARYOTIC CELL DIFFERENTIATION DURING LONG-DURATION SPACEFLIGHTS. THE EQUIPMENT CONSISTS OF AN INCUBATOR, FOUR FLASKS OF HUMAN BLOOD, AND A VESSEL FOR LIQUID AIR.

----- SPACELAB 1, COURTES -----

INVESTIGATION NAME- VERY WIDE FIELD GALACTIC CAMERA

NSSDC ID- SPALAB1-27

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
ZODIACAL LIGHT

PERSONNEL

PI - G.C. COURTES  
OI - M. VITON  
OI - J.P. SIVAN  
OI - H.L. ATKINS

CNRS-LAS  
CNRS-LAS  
CNRS-LAS  
NASA-MSC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO STUDY ZODIACAL LIGHT AND GEGENSCHEIN, EXTENDED GALACTIC OBJECTS, SKY BACKGROUND, CONTINUUM LIGHT AND EMISSION LINES IN HIS REGIONS, EXTENSION OF GALACTIC AND EXTRAGALACTIC MATERIAL, STARS AND STAR-LIKE OBJECTS, BRIGHT UV OBJECTS, DUST CONTAMINATION AROUND SPACELAB, AND EMISSION AND MORPHOLOGY STUDIES OF ATMOSPHERIC CONSTITUENTS, WITH WIDEFIELD (60 DEG) ULTRAVIOLET (130 TO 300 NM) AND SPECTROGRAPHIC PHOTOGRAPHY. THE EQUIPMENT IS A WIDE-FIELD CAMERA CONSISTING OF A HYPERBOLIC COLLECTOR, INTERCHANGEABLE SCHMIDT CHAMBERS (INCLUDING PRISM, FLAT MIRRORS AND FILTERS), AND REMOVABLE PROXIMITY-FOCUSED INTENSIFIER UTILIZING A CHANNEL ELECTRON MULTIPLIER ARRAY (CEMA) DETECTOR SYSTEM WITH A 100-FRAME FILM PACKAGE.

----- SPACELAB 1, CROMMELYNCK -----

INVESTIGATION NAME- ABSOLUTE MEASUREMENT OF THE SOLAR CONSTANT

NSSDC ID- SPALAB1-26

INVESTIGATIVE PROGRAM  
CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - D. CROMMELYNCK ROY METEOROL INST BELG  
OI - V. BORINGO ESA-ESTEC  
OI - A.C. BURNETT ESA-ESTEC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE (1) TO USE A SELF-CALIBRATING RADIOMETER TO MEASURE THE ABSOLUTE VALUE OF THE SOLAR CONSTANT, AND TO MEASURE ANY LONG-TERM VARIATIONS IN THE SOLAR CONSTANT, AND (2) TO USE SURFACES OF FUSED SILICA AND METAL EXPOSED TO PALLET CONDITIONS TO DETERMINE THE AMOUNT OF DEGRADATION OF OPTICAL SURFACES DUE TO CONDITIONS ON THE SPACELAB PALLET. THE EQUIPMENT CONSISTS OF AN ABSOLUTE RADIOMETER WITH AN INBUILT STABILITY CHECK. THIS RADIOMETER HAS TWO CHANNELS WHICH ENABLE ANY DEGRADATION OF THE BLACK SURFACES TO BE DETECTED AND COMPENSATED. THE RADIATION MEASUREMENT WILL BE MADE BY USING A HEAT BALANCE SYSTEM DRIVEN AUTOMATICALLY BY A FEEDBACK SYSTEM.

----- SPACELAB 1, ESA STAFF -----

INVESTIGATION NAME- METRIC CAMERA FACILITY

NSSDC ID- SPALAB1-38

INVESTIGATIVE PROGRAM  
CODE ER/CO-OP

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL

PI - ESA STAFF ESA-ESTEC

BRIEF DESCRIPTION

THE METRIC CAMERA FACILITY HAS A ZEISS RMK A 30/23 AERIAL SURVEY CAMERA AND A SKYLAB OPTICAL WINDOW, WITH THE FOLLOWING MAIN CHARACTERISTICS -- F = 305 MM, F-STOPS AVAILABLE - F/5.6, F/8, F/11, SHUTTER SPEEDS - 1/100 AND 1/1000 S, NEGATIVE SIZE - 23 X 23 CM (LENGTH FOR 450 PHOTOS PER MAGAZINE), ANGLE OF FIELD IS 56 DEG, AND A RESOLVING POWER OF 40 PER MM. BLACK AND WHITE, COLOR, AND COLOR IR FILMS CAN BE USED. THE MAIN TOPICS FOR THE PROPOSED MEASUREMENTS ARE ANALYTICAL MEASUREMENTS FOR CONTROL EXTENSION, TOPOGRAPHIC MAPPING, ORTHOPHOTOMAPPING, RESOLUTION EXPERIMENT, AND THERMATIC MAPPING AND INTERPRETATION. TO GET 80 PERCENT LONGITUDINAL OVERLAP OF SUBSEQUENT PHOTOGRAPHS AT A SPACELAB VELOCITY OF 7.7 KM PER S THERE WILL BE A TIME INTERVAL OF ABOUT 5 SECONDS BETWEEN TWO SUCCESSIVE EXPOSURES. STRIPS 1800 TO 2300 KM CAN BE COVERED ON THE GROUND IN EACH SEQUENCE.

----- SPACELAB 1, ESA STAFF -----

INVESTIGATION NAME- MICROWAVE FACILITY

NSSDC ID- SPALAB1-39

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
OCEANOGRAPHY

PERSONNEL

PI - ESA STAFF ESA-ESTEC

BRIEF DESCRIPTION

THE OBJECTIVES OF THE MICROWAVE FACILITY ARE TO DEVELOP ALL-WEATHER REMOTE SENSING METHODS, STUDY SENSOR-OBJECT INTERACTION BY MEASUREMENT OF OCEAN SURFACE WAVE SPECTRA WITH A DUAL-FREQUENCY SCATTEROMETER, AND VERIFY SYNTHETIC APERTURE RADAR BEHAVIOR. THE MICROWAVE REMOTE SENSING EXPERIMENT (MRSE) INSTRUMENTATION IS THE RADAR FACILITY. IN THE ACTIVE MODES THE INSTRUMENT TRANSMITS MICROWAVE ENERGY IN X-BAND (9.65 GHZ) TO EARTH TARGETS. A SENSITIVE LOW NOISE RECEIVER DETECTS THE BACKSCATTERED RADAR SIGNALS. THE INSTRUMENT WILL OPERATE IN THREE MODES: (1) A MAIN MODE AS A TWO-FREQUENCY SCATTEROMETER (2 FS), (2) A HIGH-RESOLUTION MODE AS A SYNTHETIC APERTURE RADAR (SAR), AND (3) A PASSIVE MODE AS A PASSIVE MICROWAVE RADIOMETER. IN THE 2FS MODE, THE INSTRUMENT WILL MEASURE THE OCEAN SURFACE WAVE SPECTRA BY USING THE COMPLEX BACKSCATTERING OF THE OCEAN SURFACE AT TWO ADJACENT MICROWAVE FREQUENCIES. IN THE SAR MODE, AREAS OF THE EARTH'S SURFACE WILL BE IMAGED. THE BACKSCATTERED DATA WILL BE COHERENTLY RECORDED AND OFF-LINE PROCESSING WILL PROVIDE IMAGERY WITH A GROUND RESOLUTION OF 25 BY 25 M. THE RADIOMETER MODE MEASURES OCEAN SURFACE TEMPERATURES, AND WILL BE USED IN TIME MULTIPLEX WITH OTHER MODES.

----- SPACELAB 1, ESA STAFF -----

INVESTIGATION NAME- SPACE SLED FACILITY

NSSDC ID- SPALAB1-40

INVESTIGATIVE PROGRAM  
CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - ESA STAFF ESA-ESTEC

BRIEF DESCRIPTION

THE SPACE SLED FACILITY IS PROVIDED FOR VESTIBULAR RESEARCH ON HUMAN AND ANIMAL TEST SUBJECTS. THE SLED FACILITY CONSISTS OF A PLASTIC SEAT SHELL SUSPENDED ON A GIMBAL SYSTEM WHICH CAN BE ACCELERATED BY A MOTOR ALONG TWO GUIDING RAILS FROM ONE END OF SPACELAB TO THE OTHER. THE ACCELERATION PROFILES CAN BE PRESELECTED BETWEEN 0.001 AND 0.2 G. OSCILLATING ACCELERATION OF THE SLED WILL ALSO BE POSSIBLE ( MOTION SICKNESS STUDIES). SINCE VISUAL PERCEPTION IS NOT POSSIBLE BECAUSE THE HEAD IS ENCLOSED, AND NOISE AND VIBRATION LEVELS ARE KEPT BELOW THE THRESHOLD PERCEPTION LEVEL, THE TEST SUBJECT MAY NOT BE ABLE TO DETECT ACCELERATION CHANGES OTHER THAN THOSE OF THE BALANCE ORGANS.

----- SPACELAB 1, ESA STAFF -----

INVESTIGATION NAME- SPACE PROCESSING LABORATORY

NSSDC ID- SPALAB1-42

INVESTIGATIVE PROGRAM  
CODE EM/CO-OP

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - ESA STAFF ESA-ESTEC

BRIEF DESCRIPTION

THE SPACE PROCESSING LABORATORY CONSISTS OF THREE CATEGORIES -- SYSTEM EQUIPMENT, MATERIAL SCIENCES INSTRUMENTATION, AND MATERIAL SCIENCES EXPERIMENTS. THE ISOTHERMAL HEATING FACILITY IS A MULTI-USER FACILITY FOR DIFFERENT TYPES OF EXPERIMENTS, INCLUDING SOLIDIFICATION STUDIES, DIFFUSION FUNDAMENTALS, CASTING OF METALS AND COMPOSITES, AND PREPARATION OF NEW AND/OR IMPROVED GLASSES AND CERAMICS. THE GRADIENT HEATING FACILITY FOR LOW TEMPERATURES IS DEFINED TO BE A MULTIPURPOSE FACILITY FOR DIFFERENT TYPES OF EXPERIMENTS SUCH AS CRYSTAL GROWTH AND UNIDIRECTIONAL SOLIDIFICATION OF EUTECTICS. VACUUM AND NOBLE GAS SUPPLY PROVISIONS ARE PART OF THE FACILITY. THE MIRROR HEATING FACILITY IS AN EXPERIMENTAL FACILITY WHICH IS PARTICULARLY SUITABLE FOR INVESTIGATING CRYSTAL GROWTH USING THE MELT ZONE OR TRAVELING SOLVENT METHODS. THE FLUID PHYSICS MODULE CONSISTS MAINLY OF A STRUCTURE FITTED WITH TWO DISCS WHICH CAN BE ROTATED SEPARATELY, AT THE SAME OR DIFFERENT SPEEDS, AND IN EITHER DIRECTION.

----- SPACELAB 1, GAUER -----

INVESTIGATION NAME- MEASUREMENT OF (CENTRAL) VENOUS PRESSURE  
BY PUNCTURING AN ARM VEIN

NSSDC ID- SPALAB1-1

INVESTIGATIVE PROGRAM  
CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - O.H. GAUER U OF BERLIN  
OI - R. KOCH U OF BERLIN  
OI - F. ROCKE U OF BERLIN  
OI - H. KIRSCH U OF BERLIN

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO PROCURE ABSOLUTE DATA, BY RECORDING CENTRAL VENOUS PRESSURE (MEASURED BY PUNCTURING AN ARM VEIN), THAT THE ADAPTATION OF MINERAL AND WATER METABOLISM TO THE WEIGHTLESS CONDITION IS INITIATED BY THE ENGORGEMENT OF THE CEPHALAD CIRCULATION. THE EQUIPMENT CONTAINS 6 STRAIN GAGE MANOMETERS, TAPE RECORDER, AND BATTERIES.

----- SPACELAB 1, GAUER -----

INVESTIGATION NAME- COLLECTION BLOOD SAMPLES FOR DETERMINING  
A.D.H., ALDOSTERONE, AND OTHER HORMONES

NSSDC ID- SPALAB1-37

INVESTIGATIVE PROGRAM  
CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - O.H. GAUER U OF BERLIN  
OI - H. KIRSCH U OF BERLIN  
OI - R. KOCH U OF BERLIN  
OI - F. ROCKE U OF BERLIN  
OI - M. STOBOT U OF BERLIN

ORIGINAL PAGE IS  
OF POOR QUALITY

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS THE CONFIRMATION AND COMPLETION OF SIMILAR WORK IN THE SKYLAB FLIGHTS, AND ATTEMPT TO FIND A CONNECTION WITH CIRCULATORY PARAMETERS. THE EQUIPMENT IS A CENTRIFUGE AND A STORAGE CONTAINER AT MINUS 20 DEG C.

**----- SPACELAB 1, GAUSE -----**

**INVESTIGATION NAME-** TRIBOLOGICAL STUDIES OF FLUID LUBRICANT JOURNAL

NSSDC ID- SPALAB1-10

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
TECHNOLOGY

**PERSONNEL**

PI - R.L. GAUSE  
OI - A.F. WHITAKER

NASA-MSFC  
NASA-MSFC

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO (1) DETERMINE THE EFFECT OF ZERO GRAVITY ON THE OPERATION OF FLUID-LUBRICATED JOURNAL BEARINGS, (2) OBSERVE FLUID FLOW-SURFACE WETTING AND HYDRODYNAMIC FLUID FORMATION IN JOURNAL BEARINGS OPERATING IN ZERO GRAVITY, (3) OBSERVE AND MEASURE DYNAMIC INSTABILITIES IN HYDRODYNAMIC BEARINGS IN ZERO GRAVITY, (4) EVALUATE THE USE OF MAGNETIC FIELDS AND FERROLUBRICANTS FOR PREVENTING DYNAMIC INSTABILITY IN JOURNAL BEARINGS OPERATING IN ZERO GRAVITY, AND (5) EVALUATE THE USE OF MAGNETIC FIELDS FOR CONTROLLING FERROFLUIDS IN ZERO GRAVITY. EQUIPMENT CONSISTS OF TYPICAL JOURNAL BEARING AND LUBRICANT, FERROFLUID LUBRICATED MAGNETIC JOURNAL, TRANSPARENT BEARINGS TO FACILITATE PHOTOGRAPHY AND OBSERVATION, AND A CAMERA.

**----- SPACELAB 1, GREEN -----**

**INVESTIGATION NAME-** ELECTRO-PHYSIOLOGICAL TAPE RECORDER

NSSDC ID- SPALAB1-35

**INVESTIGATIVE PROGRAM**  
CODE SB

**INVESTIGATION DISCIPLINE(S)**  
SPACE BIOLOGY

**PERSONNEL**

PI - H.L. GREEN  
OI - P.D. STOTT  
OI - H.S. WOIFF

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CLINICAL RES CENTER

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS TO STUDY ACCLIMATIZATION OF ASTRONAUTS TO ZERO GRAVITY BY MEANS OF AN ELECTROCARDIOGRAPH (ECG), ELECTROENCEPHALOGRAPH (EEG), AND ELECTRO-OCELOGRAPH (EOG) ON A CONTINUOUS BASIS BY A MINIATURE TAPE RECORDER ATTACHED TO THE CREW MEMBER. THE EQUIPMENT CONSISTS OF ECG, EEG, AND EOG ELECTRODES, PREAMPLIFIER, TAPE RECORDER, AND BATTERIES.

**----- SPACELAB 1, HART -----**

**INVESTIGATION NAME-** GEOPHYSICAL FLUID FLOW

NSSDC ID- SPALAB1-08

**INVESTIGATIVE PROGRAM**  
CODE RS

**INVESTIGATION DISCIPLINE(S)**  
SOLAR PHYSICS  
ASTRONOMY

**PERSONNEL**

PI - J.E. HART  
OI - J. TOORRE  
OI - P. GILMAN  
OI - G. FICHTL

U OF COLORADO  
U OF COLORADO  
HIGH ALTITUDE OBS  
NASA-MSFC

**BRIEF DESCRIPTION**

THERE ARE TWO EXPERIMENT OBJECTIVES. ONE OBJECTIVE OF THIS EXPERIMENT IS TO UNDERSTAND THE CONVECTION OF STARS AND THE SUN BY -- (1) STUDYING THE ONSET OF CONVECTION BETWEEN CONCENTRIC SPHERES AS A FUNCTION OF IMPOSED TEMPERATURE DIFFERENCES AND ROTATION, (2) STUDYING THE SHAPES OF THE CONVECTION CELLS AT THE ONSET OF CONVECTION AND ITS EVOLUTION, (3) STUDYING THE INTERACTIVE MOTIONS SUCH AS MEAN AZIMUTHAL FLOWS OBSERVED ON THE SOLAR EQUATORIAL REGION. THE OTHER OBJECTIVE IS TO ACT AS THE FORERUNNER OF A SERIES OF PROPOSED EXPERIMENTS TO STUDY THE BAROCLINIC PROPERTIES OF THE EARTH'S ATMOSPHERE AND THE GENERAL CIRCULATION OF THE EARTH'S OCEAN BASINS. THE EQUIPMENT CONSISTS OF AN ELECTROCONVECTION CELL, CONTROLLERS, AND A CAMERA.

**----- SPACELAB 1, HERBE -----**

**INVESTIGATION NAME-** WAVES IN THE OH EMISSIVE LAYER

NSSDC ID- SPALAB1-19

**INVESTIGATIVE PROGRAM**  
CODE EB/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
METEOROLOGY  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - M. HERBE  
OI - G. MOREELS

CNRS-SA  
CNRS-SA

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO STUDY THE LARGE-SCALE STRUCTURE OF THE ATMOSPHERIC OH EMISSION, AND TO INVESTIGATE POSSIBLE RELATIONS BETWEEN THE OH EMISSION STRUCTURE AND DROGRAPHY OR METEOROLOGICAL PHENOMENA. THE EQUIPMENT CONTAINS AN IMAGE INTENSIFIER WITH A CAMERA, FILTER, AND 16-MM MOVIE CAMERA WITH A 25-MM F/0.95 LENS. THE SPECTRAL PART OF THE AIRGLOW IS DELIMITED ON THE SHORT WAVELENGTH SIDE BY A WRATTEN 88A FILTER (80 PERCENT CUTOFF AT 75 NANOMETERS) AND ON THE IR SIDE BY THE SENSITIVITY OF THE PHOTOCATHODE (50 PERCENT CUTOFF AT 830 NANOMETERS).

**----- SPACELAB 1, HONECK -----**

**INVESTIGATION NAME-** MICRO-ORGANISMS AND BIOMOLECULES IN THE SPACE ENVIRONMENT

NSSDC ID- SPALAB1-34

**INVESTIGATIVE PROGRAM**  
CODE SB/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
SPACE BIOLOGY

**PERSONNEL**

PI - S. HONECK  
OI - C. THOMAS-GORFIAS  
OI - G. REITZ

U OF FRANKFURT  
U OF FRANKFURT  
U OF FRANKFURT

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO -- (1) MEASURE QUANTITATIVELY THE EFFECTS OF SPACE PARAMETERS (VACUUM, SOLAR UV-RADIATION) ON MICROBIAL BACTERIAL SPORES, BACTERIAL VEGETATIVE CELLS, BACTERIOPHAGES AND ENZYMES, AND TO UNDERSTAND THE EFFECTS ON THESE SAMPLES; (2) EVALUATE THE CONSEQUENCES OF GENETIC AND RESPONSE ALTERATIONS; AND (3) COMPARE THE RESULTS WITH SIMULATION EXPERIMENTS PERFORMED IN THE LABORATORY. THE EQUIPMENT IS A BOX ACCOMMODATING 100 TO 200 BIOLOGICAL SAMPLES.

**----- SPACELAB 1, KIMZEY -----**

**INVESTIGATION NAME-** INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN

NSSDC ID- SPALAB1-14

**INVESTIGATIVE PROGRAM**  
CODE SB

**INVESTIGATION DISCIPLINE(S)**  
SPACE BIOLOGY

**PERSONNEL**

PI - S.L. KIMZEY  
OI - M.H. CROSBY  
OI - M. TAVASSOLI  
OI - P.C. JOHNSON  
OI - J.P. CHEN  
OI - C.D.R. DUNN  
OI - R.D. LANGE  
OI - E.C. LARKIN

NASA-JSC  
SCRIPPS C+R FOUNDATION  
SCRIPPS C+R FOUNDATION  
Baylor U  
U OF TENNESSEE  
U OF TENNESSEE  
U OF TENNESSEE  
VETERANS ADMIN HOSP

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS TO OBTAIN NEW AND SPECIFIC INFORMATION PERTAINING TO THE MECHANISM AND SITE OF ACTION RELATED TO THE RED BLOOD CELL MASS AND PLASMA VOLUME CHANGES OBSERVED DURING SPACE FLIGHT. THE EQUIPMENT CONSISTS OF AN IN-FLIGHT BLOOD COLLECTION SYSTEM AND A REFRIGERATOR.

**----- SPACELAB 1, MENDE -----**

**INVESTIGATION NAME-** ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING

NSSDC ID- SPALAB1-03

**INVESTIGATIVE PROGRAM**  
CODE ST

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - S.B. MENDE  
OI - R.H. EATHER  
OI - R.J. MAURANN  
OI - D.L. REASONER  
OI - G.R. SWENSON  
OI - B.J. DUNCAN  
OI - K.S. CLIFTON

LOCKHEED PALO ALTO  
BOSTON COLLEGE  
NASA-MSFC  
NASA-MSFC  
NASA-MSFC  
NASA-MSFC  
NASA-MSFC

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO (1) INVESTIGATE THE UPPER ATMOSPHERIC TRANSPORT PROCESSES THROUGH THE MEASUREMENT OF RESONANT SCATTERED EMISSIONS FROM POSITIVE NG IONS, (2) MEASURE EXCITATION CROSS SECTIONS OF UPPER ATMOSPHERIC CONSTITUENTS USING INJECTED PARTICLE BEAMS AND DETECTION OF THE RESULTING EMISSIONS, (3) INVESTIGATE ATMOSPHERIC COMPOSITION AND ENERGY BUDGET THROUGH OBSERVATIONS OF NATURAL AURORA, (4)

OBSERVE LARGE- AND SMALL-SCALE AURORAL MORPHOLOGY AND COMPARE ULTRAVIOLET AND VISIBLE AURORA FEATURES; (2) SUPPORT THE ELECTRON ACCELERATOR IN CONDUCTING MEASUREMENTS OF MAGNETOSPHERIC ELECTRIC FIELDS; AND (3) MEASURE SMALL PARTICULATE CONTAMINATION AROUND THE SHUTTLE/SPACELAB. THE EQUIPMENT CONSISTS OF -- (1) A DUAL-CHANNEL VIDEO SYSTEM WITH ASSOCIATED OPTICS AND DATA HANDLING ELECTRONICS MOUNTED ON A STABILIZED PLATFORM FOR POINTING AND CONTROL, (2) SEE VIDICON FOR HIGH-SENSITIVITY, HIGH-RESOLUTION OPERATION, (3) A LOW-RESOLUTION MICROCHANNEL PLATE ARRAY OPERATING IN A PHOTON COUNTING MODE, AND (4) CMOS AND ONBOARD RECORDERS UTILIZED FOR DATA DISPLAY AND RECORDING. THE MAGNESIUM POSITIVE ION RESONANCE LINE WILL BE IMAGED AT 279.5 AND 280.2 NANOMETERS. FOR THE ATOMIC OXYGEN POSITIVE ION 2-P STATE STUDY, SIMULTANEOUS SENSING AT 731.9 AND 247.0 NANOMETERS WILL BE OBTAINED.

----- SPACELAB 1, OBAYASHI -----

INVESTIGATION NAME- SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPARC)

NSSDC ID- SPALAB1-02 INVESTIGATIVE PROGRAM CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS

PERSONNEL

PI - T. OBAYASHI	U OF TOKYO
OI - J.W. BELLEN, JR.	TRW SYSTEMS GROUP
OI - J.L. BURCH	SOUTHWEST RES INST
OI - C.R. CHAPPELL	NASA-MSFC
OI - W.T. ROBERTS	NASA-MSFC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO USE AN ELECTRON BEAM ACCELERATOR AND A MAGNETO-PLASMA DYNAMIC (MPD) ARCJET TO STUDY: (1) AURORAL PRODUCTION IN THE UPPER ATMOSPHERE, (2) IONOSPHERE PARAMETERS SUCH AS ANOMALOUS RESISTIVITY, PLASMA COUPLING PROCESS, ELECTRIC AND MAGNETIC FIELD MORPHOLOGY, VEHICLE CHARGE NEUTRALIZATION, SHUTTLE/SPACELAB INDUCED ENVIRONMENTS, ELECTRON BEAM/ NEUTRAL PLUME INTERACTION, THE COUPLING BETWEEN THE EARTH'S ATMOSPHERE AND MAGNETOSPHERE, AND (3) THE EFFECTS OF PARTICLE INTERACTIONS ON ATMOSPHERIC DYNAMICS. THE EQUIPMENT CONSISTS OF AN ELECTRON BEAM ACCELERATOR, MAGNETO-PLASMA DYNAMIC ARCJET, BATTERY/CAPACITOR BANK TO PROVIDE HIGH DISCHARGE CURRENT, MONITOR AND DIAGNOSTIC DEVICES, AND CONTROL, DISPLAY, AND DATA MANAGEMENT SYSTEMS. THE ELECTRON BEAM ACCELERATOR, MPD ARCJET, AND NEUTRAL GAS EJECTOR ARE CONTAINED IN THE ACCELERATOR SUBSYSTEM. THE ELECTRON BEAM ACCELERATOR IS CAPABLE OF OPERATING AT VOLTAGES FROM 1 TO 7.5 KILOVOLTS AT A MAXIMUM OF 1.5 AMPS AND WITH A VARIABLE PULSE WIDTH OF FROM 10 MILLISECONDS TO 1 SECOND. THE PPD ARCJET USES ARGON GAS AND HAS AN ENERGY INPUT OF 2 KILOJOULES PER PULSE. THE THIRD ACCELERATOR COMPONENT IS A NEUTRAL GAS PLUME GENERATOR WHICH USES NITROGEN AS THE GAS.

----- SPACELAB 1, PAN -----

INVESTIGATION NAME- BEARING LUBRICANT WETTING, SPREADING AND OPERATING CHARACTERISTICS IN ZERO-G

NSSDC ID- SPALAB1-09 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - C.H.T. PAN	SHAKER RESEARCH CORP
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BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO -- (1) DETERMINE THE EXTENT TO WHICH SELECTED COMMERCIAL LUBRICANT WETTABILITY IS Affected BY A ZERO-GRAVITY ENVIRONMENT, (2) DETERMINE HOW BEARING TORQUE, BEARING LUBRICANT FEEDING, AND BEARING OPERATING FILMS ARE ALTERED BY OPERATIONS IN ZERO GRAVITY, (3) COMPARE RESULTS WITH LABORATORY RESEARCH OF COMMERCIAL APPLICATIONS, AND (4) PROVIDE DATA FOR APPLICATIONS IN SPACE HARDWARE. THE EQUIPMENT CONSISTS OF PLATES FOR LUBRICANT WETTING AND SPREADING TESTS, HYDRODYNAMIC JOURNAL BEARING, AND AN AVAILABLE FLIGHT CAMERA. TWO TYPES OF EXPERIMENTS WILL BE CONDUCTED NAMELY, WETTING AND SPREADING ON STATIONARY SURFACES, AND TWO-PHASE BOUNDARY IN A JOURNAL BEARING CONFIGURATION. IN EACH CASE, THE FLUID-SURFACE COMBINATION WILL BE THE PRIMARY CONTROL PARAMETER.

----- SPACELAB 1, RECHKE -----

INVESTIGATION NAME- VESTIBULO-SPINAL REFLEX MECHANISMS

NSSDC ID- SPALAB1-16 INVESTIGATIVE PROGRAM CODE SB

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - M.F. RECHKE	NASA-JSC
OI - J.L. HORICK	NASA-JSC
OI - D.J. ANDERSON	U OF MICHIGAN

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO USE THE ESA SLED TO DETERMINE IF THE VESTIBULO-SPINAL REFLEX MEASUREMENT TECHNIQUE (H-REFLEX) IS SUITABLE AS AN EFFECTIVE PREDICTOR OF SUSCEPTIBILITY TO SPACE MOTION SICKNESS, AND TO STUDY THE RELATIONSHIP BETWEEN MOTION SICKNESS SENSITIVITY ON THE EARTH WITH CHANGES IN POSTURAL REFLEXES OBSERVED IN FLIGHT. THE EQUIPMENT CONSISTS OF A SLED FACILITY, POWER MODULE CONTAINING PULSE GENERATOR-OSCILLOSCOPE, DIFFERENTIAL AMPLIFIER AND MICROPROCESSOR, PREAMPLIFIER, STIMULUS ISOLATION UNIT, AND ELECTRODE KIT.

----- SPACELAB 1, ROSS -----

INVESTIGATION NAME- MASS DISCRIMINATION DURING WEIGHTLESSNESS

NSSDC ID- SPALAB1-30 INVESTIGATIVE PROGRAM CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - M. ROSS	U OF STIRLING
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BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO COMPARE MASS DISCRIMINATION WHEN BOTH THE OBSERVER AND THE TEST OBJECTS ARE WEIGHTLESS, WITH WEIGHT DISCRIMINATION UNDER NORMAL GRAVITY. THE EQUIPMENT IS A BOX CONTAINING WEIGHTED CONTAINERS, A BLINDFOLD, INSTRUCTIONS, AND RECORD CARDS.

----- SPACELAB 1, SCANO -----

INVESTIGATION NAME- BALLISTOCARDIOGRAPHIC RESEARCH IN WEIGHTLESSNESS

NSSDC ID- SPALAB1-33 INVESTIGATIVE PROGRAM CODE SB/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - A. SCANO	U OF ROME
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BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO RECORD A THREE-DIMENSIONAL BALLISTOCARDIOGRAM (BCG) IN RESTING WEIGHTLESS MAN AND COMPARE IT WITH SIMILAR TRACINGS RECORDED ON THE SAME SUBJECT IN GROUND CONDITIONS, POSSIBLY TO FIND BCG MODIFICATIONS IN RELATION TO CARDIOVASCULAR ADAPTATION TO WEIGHTLESSNESS, AND TO RECORD OTHER BODY ACCELERATIONS IN RELATION TO DIAPHRAGM DYNAMICS DURING SPONTANEOUS BREATHING, HYPERVENTILATION, AND COUGH. THE EQUIPMENT CONSISTS OF THREE SERVO-ACCELEROMETERS AND ONE ELECTROCARDIOGRAPH RECORDER WITH FOUR CHANNELS.

----- SPACELAB 1, SULZMAN -----

INVESTIGATION NAME- CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS

NSSDC ID- SPALAB1-15 INVESTIGATIVE PROGRAM CODE SB

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - F.M. SULZMAN	HARVARD U
OI - M.C. MOORE	HARVARD U

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVES ARE TO (1) TEST IF CIRCADIAN RHYTHMS PERSIST OUTSIDE THE EARTH'S ENVIRONMENT, AND TO DETERMINE IF THE CIRCADIAN TIMING SYSTEM IS EXOGENOUS OR ENDOGENOUS, AND (2) EXAMINE THE INFLUENCE OF THE SPACE ENVIRONMENT ON THE CIRCADIAN ORGANIZATION. THE EQUIPMENT CONSISTS OF A LIGHT-TIGHT BOX CONTAINING 24 GROWTH TUBES.

----- SPACELAB 1, THEILE -----

INVESTIGATION NAME- DC AND LOW FREQUENCY VECTOR MAGNETOMETER

NSSDC ID- SPALAB1-23 INVESTIGATIVE PROGRAM CODE ST/CO-OP

INVESTIGATION DISCIPLINE(S)  
MAGNETOSPHERIC PHYSICS  
PARTICLES AND FIELDS

**PERSONNEL**

PI - D. THEILE

BRAUNSCHWEIG TECH U

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO USE A THREE-AXIS FLUORONATE MAGNETOMETER TO STUDY: (1) MAGNETIC FIELDS OF THE IONOSPHERIC POLAR ELECTROJET AND ITS RETURN CURRENT, EQUATORIAL ELECTROJET, AND THE SOLAR QUIET CURRENT; (2) THE VECTOR MAGNETIC FIELDS AS A PLASMA PARAMETERS AND (3) THE SPACELAB MAGNETIC FIELD BACKGROUND. THE EQUIPMENT CONSISTS OF TWO SEPARATE THREE-AXIS FLUORONATE SENSORS.

----- SPACELAB 1, THUILLIER-----

**INVESTIGATION NAME-** TEMPERATURE AND WIND MEASUREMENTS IN THE MESOSPHERE AND THERMOSPHERE

NSSDC ID- SPALAB1-20

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
METEOROLOGY  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

**PERSONNEL**PI - G. THUILLIER  
OI - J.-E. BLAMONT  
OI - M.L. BUDDIN  
OI - P. CONNESCNRS-SA  
CNRS-SA  
CNET  
PARIS OBSERVATORY**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO USE A MICHELSON INTERFEROMETER TO (1) DETERMINE THE TEMPERATURE AND WIND PROFILES FROM THE TOP OF THE MESOSPHERE TO THE THERMOSPHERE BY ANALYSIS OF THE LINE WIDTHS AND DOPPLER SHIFTS OF NATURAL EMISSION OF DAYGLOW AND NIGHTGLOW CONSTITUENTS, AND (2) TO USE THIS EXPERIMENT AS A DEMONSTRATION FOR MORE SOPHISTICATED INSTRUMENTS TO BE FLOWN ON FUTURE MISSIONS. THE EQUIPMENT CONSISTS OF THREE FIELD-COMPENSATED MICHELSON INTERFEROMETERS, A HIGH-RESOLUTION INSTRUMENT, AND A CASSEGRAIN TELESCOPE. THE 630.0 AND 557.7 NANOMETER OI LINES AND THE 731.9 NANOMETER OII LINE OF THE AIRGLOW SPECTRUM WILL BE OBSERVED FOR THERMOSPHERIC MEASUREMENTS. FOR MESOSPHERIC MEASUREMENTS, THE 557.7 NANOMETER LINE AND THE 730.0 NANOMETER LINES IN THE (8-3) BAND OF THE OH POSITIVE ION RADICAL WILL BE UTILIZED.

----- SPACELAB 1, THUILLIER-----

**INVESTIGATION NAME-** MEASUREMENT OF THE SOLAR SPECTRUM FROM 190 TO 4000 NANOMETERS

NSSDC ID- SPALAB1-21

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
SOLAR PHYSICS

**PERSONNEL**PI - G. THUILLIER  
PI - P. SIMON  
OI - J.-E. BLAMONT  
OI - R. PASTIERS  
OI - D. LABSCNRS-SA  
IASB  
CNRS-SA  
IASB  
LANDESSTERNWARTE**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS TO MEASURE THE SOLAR SPECTRAL IRRADIANCE BETWEEN 170 AND 3200 NANOMETERS WITH AN ACCURACY OF 0.1 PERCENT IN ORDER TO DETERMINE SOLAR CONSTANT, VARIATIONS IN SOLAR CONSTANT WITH SOLAR CYCLE USING SPACELAB/STS FLIGHTS OVER A 10-YEAR PERIOD, AND VARIATIONS OF IRRADIANCE WITHIN EACH SPECTRAL REGION. THE EQUIPMENT CONSISTS OF THREE GRATING SPECTROMETERS COVERING UV = 170.0 TO 370.0 NM (1 NM BANDPASS), VISIBLE = 350.0 TO 900 NM (1 NM BANDPASS), AND IR = 800 TO 3200 NM (10 NM BANDPASS).

----- SPACELAB 1, TORR-----

**INVESTIGATION NAME-** AN IMAGING SPECTROMETRIC OBSERVATORY

NSSDC ID- SPALAB1-01

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS

**PERSONNEL**PI - M.R. TORR  
OI - A.L. BROADFOOT  
OI - D.E. SHERANSKY  
OI - B.R. SANDEL  
OI - S.K. ATREYA  
OI - G.R. CARIGNAN  
OI - J.C.G. WALKER  
OI - D.B. TORR  
OI - T.M. DONAHUEU OF MICHIGAN  
U OF SOUTHERN CALIF  
U OF SOUTHERN CALIF  
U OF SOUTHERN CALIF  
U OF MICHIGAN  
U OF MICHIGAN  
U OF MICHIGAN  
U OF MICHIGAN  
U OF MICHIGAN**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO: (1) OBTAIN THE FIRST DAYTIME MEASUREMENTS OF THE AIRGLOW SPECTRUM FROM THE EXTREME ULTRAVIOLET TO THE INFRARED (120 TO 1200 NM), (2) TO MONITOR THE SHUTTLE INDUCED CONTAMINATIONS AND (3) TO SERVE AS A PRECURSOR FOR FUTURE SHUTTLE FLIGHTS. IT IS PLANNED TO MEASURE EMISSIONS FROM A LARGE RANGE OF MINOR CONSTITUENTS, METASTABLE AND EXCITED SPECIES OF BOTH ATOMIC AND MOLECULAR IONS, AND NEUTRALS IN THE ATMOSPHERE FROM THE STRATOSPHERE TO THE UPPER THERMOSPHERE. THE FLIGHT INSTRUMENT IS DESIGNED FOR HIGH SPEED OPERATION AS AN IMAGING DEVICE, AND IS COMPOSED OF FIVE IDENTICAL SPECTROMETERS, EACH OF WHICH IS RESTRICTED TO A GIVEN SPECTRAL RANGE WITHIN THE 20 TO 1200 NM REGION. EACH MODULE IS AN IMAGING SCANNING SPECTROMETER WITH COINCIDENT 0.5 X 0.007 DEG FIELDS OF VIEW. IMAGING CAPABILITY IS OBTAINED ALONG THE LENGTH OF THE OBSERVATIONAL FIELD BY USE OF AN AREA ARRAY DETECTOR COMPRISING 190 X 204 ELEMENTS. THUS, A SINGLE MEASUREMENT PRODUCES ADJACENT SPECTRA IN A GIVEN MODULE OBTAINED FROM ADJACENT OBSERVATIONAL FIELDS. WAVELENGTH RESOLUTION VARIES BETWEEN 0.2 AND 0.6 NM OVER THE SPECTRAL RANGE. A SCAN MIRROR IS USED, AND A SINGLE EXPOSURE AT ONE SCAN POSITION COVERS A 250 NM REGION. THE TELESCOPE WILL BE BAFFLED, AND WILL HAVE SEVERAL OPERATING MODES.

----- SPACELAB 1, VON BAUMGARTEN-----

**INVESTIGATION NAME-** HUMAN VESTIBULAR REACTIONS AND SENSATION IN SPACE (SLED EXPERIMENTS)

NSSDC ID- SPALAB1-41

**INVESTIGATIVE PROGRAM**  
CODE SB/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
SPACE BIOLOGY

**PERSONNEL**PI - R. VON BAUMGARTEN  
OI - J. DICHGANS  
OI - T. BRANDT  
OI - H. SCHERERU OF MAINZ  
U OF FREIBURG  
KRUPP KRANKEN-ANGSTALN  
U OF MUNICH**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS TO USE THE SLED TO STUDY THE VISUO-VESTIBULAR COORDINATION AND THE INTEGRATION OF MULTISENSORY STIMULI WITHIN THE ORIENTATION CENTERS OF THE BRAIN BY EXPOSING THE SUBJECT TO SHORT PERIODS OF LINEAR ACCELERATION IN CONJUNCTION WITH CPTOKINETIC STIMULATION AND CALORIC STIMULATION. IN ADDITION TO THE SPACE SLED, THE EQUIPMENT CONTAINS AN OPTOKINETIC STIMULATION DISPLAY, A CALORIC STIMULATION SYSTEM, AN OPTICAL TARGET SETTING SYSTEM, AN EYE MOVEMENT RECORDER, AN ELECTROMYOGRAPHIC RECORDING SYSTEM, AN ELECTRONYSTAGMOGRAPHIC RECORDING SYSTEM, ELECTROCARDIOGRAPHIC RECORDING SYSTEM, AND A MOTION PERCEPTION INDICATOR.

----- SPACELAB 1, VOSS, JR.-----

**INVESTIGATION NAME-** EFFECTS OF PROLONGED WEIGHTLESSNESS ON THE HUMORAL IMMUNE RESPONSE IN HUMANS

NSSDC ID- SPALAB1-17

**INVESTIGATIVE PROGRAM**  
CODE SW/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
SPACE BIOLOGY

**PERSONNEL**

PI - E.W. VOSS, JR.

U OF ILLINOIS

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE AN EVALUATION OF PROLONGED WEIGHTLESSNESS AS A STRESS FACTOR EFFECT ON THE HUMORAL IMMUNE RESPONSE OF HUMANS, AND TO ESTABLISH THE CAPABILITY OF HUMANS TO RESPOND IMMUNOLOGICALLY TO POTENTIAL FOREIGN PATHOGENS DURING FUTURE SUSTAINED SPACE FLIGHT. THE EQUIPMENT INCLUDES A CONTAINER FOR STORING BLOOD SAMPLES, STERILE SYRINGES, NEEDLES, AND TEST TUBES.

----- SPACELAB 1, WILHELM-----

**INVESTIGATION NAME-** STUDY OF LOW-ENERGY ELECTRON FLUX AND ITS REACTION TO ACTIVE EXPERIMENTATION

NSSDC ID- SPALAB1-24

**INVESTIGATIVE PROGRAM**  
CODE ST/CO-OP

**INVESTIGATION DISCIPLINE(S)**  
PARTICLES AND FIELDS

**PERSONNEL**PI - K. WILHELM  
OI - W. STUDEMAN  
OI - W. RIEDLERMPI-AERONOMY  
MPI-AERONOMY  
TECH U OF GRAZ**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO FLY A 2-FI FIELD OF VIEW ELECTROSTATIC ANALYZER TO MEASURE NATURAL ELECTRON FLUXES IN THE 0.1 TO 12.0 KEV RANGE TO STUDY PRECIPITATION PROCESS IN AURORAL EMISSION, EFFECTS OF THE ELECTRON ACCELERATOR (SEPAR) OPERATIONS ON THE NATURAL ELECTRON FLUXES, THE INFLUENCE OF THE SHUTTLE/SPACELAB GENERATED ATMOSPHERE ON THE NATURAL ELECTRON FLUX, AND TO STUDY NATURAL ELECTRON FLUXES AS A SENSITIVE PROBE OF THE SURFACE CHARGE ON THE STS/SPACELAB. THE EQUIPMENT CONSISTS OF AN ELECTROSTATIC DEFLECTION DEVICE WITH A

HEMISPHERIC FIELD OF VIEW AND WITH AZIMUTH AND PITCH-ANGLE RESOLUTION, AND EIGHT CONTINUOUS-CHANNEL ELECTRON MULTIPLIERS FOR DETECTORS.

----- SPACELAB 1, WILLSON-----

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER SOLAR IRRADIANCE MONITOR

NSSDC ID- SPALAB1-04 INVESTIGATIVE PROGRAM CODE 87/CO-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL

PI - R.C. WILLSON  
OI - R. BEER  
OI - M. ZIRIN  
OI - J. KENDALL, SR.

NASA-JPL  
NASA-JPL  
CALIF INST OF TECH  
CALIF INST OF TECH

BRIEF DESCRIPTION

THE OBJECTIVE OF THE ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR EXPERIMENT IS TO MEASURE THE TOTAL SOLAR IRRADIANCE WITH MAXIMUM ACCURACY AND PRECISION. THE SOLAR IRRADIANCE FROM FAR ULTRAVIOLET THROUGH FAR INFRARED WAVELENGTHS WILL BE MEASURED BY THREE TYPE IV ACTIVE CAVITY RADIOMETER DETECTORS. THESE DETECTORS ARE ELECTRICALLY SELF-CALIBRATED. CAVITY PYRHELIOIMETERS EACH CAPABLE OF DEFINING THE ABSOLUTE RADIATION SCALE WITH AN UNCERTAINTY OF PLUS OR MINUS 0.1 PERCENT IN THE INTERNATIONAL SYSTEM OF UNITS (SI) AT THE SOLAR 'CONSTANT' LEVEL. THE THREE DETECTORS WILL BE INDEPENDENTLY SHUTTERED, AND THEIR CYCLES OF OPERATION WILL BE DIFFERENT. CHANNEL A WILL BE USED ROUTINELY TO MONITOR THE TOTAL SOLAR IRRADIANCE. THE TIME CONSTANT FOR A REFERENCE OR OBSERVATION PHASE STEP FUNCTION OF SOLAR 'CONSTANT' MAGNITUDE WILL BE LESS THAN 2 S. THE SECOND DETECTOR (CHANNEL B) WILL BE INTERMITTENTLY COMPARED WITH CHANNEL A TO ESTABLISH A'S LONG-TERM STABILITY OR TO CALIBRATE ANY APPARENT DEGRADATION. CHANNEL C, AFTER INITIAL COMPARISON WITH A AND B, WILL BE USED ONLY TO RESOLVE AMBIGUITIES ARISING FROM OPERATION OF THE FIRST TWO.

----- SPACELAB 1, YOUNG-----

INVESTIGATION NAME- VESTIBULAR STUDIES

NSSDC ID- SPALAB1-13 INVESTIGATIVE PROGRAM CODE 88/CO-OP

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - L.E. YOUNG  
OI - G.M. JONES  
OI - R.E. MALCOLM  
OI - K.E. HONEY  
OI - C.M. OMAN

MASS INST OF TECH  
MC/BILL U  
DOC INST OF ENVIRN MED  
DOC INST OF ENVIRN MED  
MASS INST OF TECH

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO DETERMINE IF OTOLITH SENSITIVITY CHANGES ARE INVOLVED IN SPACE MOTION SICKNESS AND POSTFLIGHT POSTURAL DISTURBANCES. EQUIPMENT CONSISTS OF SLED FACILITY, MOTOR-DRIVEN ROTATING FIELD, 16-MM MOVIE CAMERA, CALIBRATION LIGHT ARRAY, STATION FOR HOPPING TEST, AND TAPE RECORDER.

\*\*\*\*\* SPACELAB 2\*\*\*\*\*

SPACECRAFT COMMON NAME- SPACELAB 2  
ALTERNATE NAMES-

NSSDC ID- SPALAB2

LAUNCH DATE- 11/00/83 WEIGHT- 14500. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-055

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 93.5 MIN  
PERIASTRIS- 400. KM ALT

INCLINATION- 50. DEG  
APOASTRIS- 400. KM ALT

PERSONNEL

MM - R.E. PAGE  
MS - F.W. URBAN  
MG - W.R. WITT  
SC - E. WEILER  
PM - D.C. JEAN

NASA-HSFC  
NASA-HSFC  
NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-HSFC

BRIEF DESCRIPTION

SPACELAB 2 CONSISTS OF THREE PALLETS AND A UNIQUE STRUCTURE (CALLED THE 16100) ON WHICH VARIOUS INSTRUMENTS ARE EXPOSED TO THE SPACE ENVIRONMENT. INCLUDED IN THE PAYLOAD IS THE INSTRUMENT POINTING SYSTEM BUILT BY THE EUROPEAN SPACE AGENCY (ESA) AND DESIGNED TO POINT THE INSTRUMENTS AT TARGETS OF OPPORTUNITY. THE FOLLOWING INVESTIGATIONS HAVE BEEN CHOSEN TO FLY ON THIS MISSION: VITAMIN D METABOLITES AND RENE DEMINERALIZATION; INTERACTION OF OXYGEN AND GRAVITY-INFLUENCED

LIGNEIFICATION; EJECTABLE PLASMA DIAGNOSTICS PACKAGE; PLASMA DEPLETION EXPERIMENTS FOR IONOSPHERIC AND RADIO ASTRONOMICAL STUDIES; SMALL HELIUM-COOLED INFRARED TELESCOPE; ELEMENTAL COMPOSITION AND ENERGY SPECTRA OF COSMIC RAY NUCLEI BETWEEN 90 GEV PER NUCLEON AND SEVERAL TEV PER NUCLEON; HARD X-RAY IMAGING OF CLUSTERS OF GALAXIES AND OTHER EXTENDED X-RAY SOURCES; SOLAR MAGNETIC AND VELOCITY FIELD MEASUREMENT SYSTEM; CORONAL HELIUM ABUNDANCE SPACELAB EXPERIMENT; HIGH-RESOLUTION TELESCOPE AND SPECTROGRAPH; SOLAR UV SPECTRAL IRRADIANCE MONITOR; IN-ORBIT CALIBRATION OF MEGA LOW-GRAVITY ACCELEROMETER; AND PROPERTIES OF SUPERFLUID HELIUM IN ZERO GRAVITY.

----- SPACELAB 2, BRUECKNER-----

INVESTIGATION NAME- SOLAR UV HIGH-RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS)

NSSDC ID- SPALAB2-10 INVESTIGATIVE PROGRAM CODE 87

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER  
OI - J.D.F. BARTOE  
OI - D.K. PRINZ  
OI - M.E. VAN HOOSIER

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE: (1) THE STUDY OF THE ENERGY TRANSPORT AND MASS BALANCE OF THE TEMPERATURE MINIMUM, CHROMOSPHERE, TRANSITION ZONE AND CORONA IN THE QUIET SUN AS WELL AS IN PLAGES, FLARES, AND SUNSPOTS; (2) THE EXAMINATION OF THE VELOCITY FIELD OF THE LOWER CORONA TO STUDY THE ORIGIN OF THE SOLAR WINDS; (3) THE STUDY OF THE STRUCTURE AND DYNAMICS OF SPIKULES AND SUPERSPIKULES IN THE UV SPECTRUM; (4) THE STUDY OF STRUCTURE AND DYNAMICS OF PROMINENCES; AND (5) THE STUDY OF PRE-FLARE AND FLARE PHENOMENA. THESE OBJECTIVES ARE OBTAINED THROUGH INTENSITY MEASUREMENTS, DOPPLER MEASUREMENTS, AND LINE PROFILE ANALYSIS OF HIGH SPATIAL RESOLUTION (1 ARC-SE) AND HIGH SPECTRAL RESOLUTION (9 PICOMETER) OF UV SPECTRA (WAVELENGTHS 117.5-170 NANOMETERS) COVERING A WIDE VARIETY OF CONTINUA AND EMISSION LINES THAT ORIGINATE IN DIFFERENT TEMPERATURE REGIMES OF THE SOLAR ATMOSPHERE. THE INSTRUMENTATION CONSISTS OF A STIGMATIC SPECTROGRAPH WITH A SLIT THAT COVERS THE FULL SOLAR RADIUS SIMULTANEOUSLY WITH 1000 RESOLUTION ELEMENTS. THUS THE SLIT COVERS MANY DIFFERENT SOLAR FEATURES AT THE SAME TIME. ONE SPECTRUM CONTAINS ENOUGH INFORMATION FOR A STATISTICAL ANALYSIS. PHOTOGRAPHS OF A SERIES OF SPECTRA OVER A PERIOD OF AT LEAST 15 MIN ARE MADE IN ORDER TO FOLLOW THE CHANGES IN THE INTENSITY, DOPPLER VELOCITIES, AND LINE PROFILES AS THEY ARE CAUSED BY DISTURBANCES MOVING THROUGH THE SOLAR ATMOSPHERE. SPECTROHELIOPHOTOGRAMS OF TWO DIMENSIONS AS A FUNCTION OF TIME ARE CONSTRUCTED IN ORDER TO INVESTIGATE THE 3-DIMENSIONAL STRUCTURE OF THE CHROMOSPHERE AND TRANSITION ZONE. A SYSTEMATIC MAPPING OF THE CORONAL VELOCITY FIELD OVER THE WHOLE SUN IS ALSO MADE ALONG WITH A SERIES OF LIMA SPECTRA AT DIFFERENT ALTITUDES FOR STUDIES OF STRUCTURE AND DYNAMICS OF SPIKULES. THE SLIT IS POINTED WITHIN A TOLERANCE OF HALF A SLIT WIDTH FOR A DURATION OF AT LEAST 15 MIN. THE SLIT OF THE HIGH RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS) IS STEPPED IN RAPID SEQUENCE OVER A SMALL AREA OF THE SUN (PLUS OR MINUS 5 ARC-SE), WHICH ALLOWS THE SPECTROHELIOPHOTOGRAMS TO BE MADE. THE HRTS CONSISTS OF A 30-CM GREGORIAN TELESCOPE OF 90-CM FOCAL LENGTH, A UV SPECTROGRAPH, A 160 NANOMETER BROAD-BAND SPECTROHELIOPHOTOGRAPH, AND AN H ALPHA SPLIT DISPLAY SYSTEM HOUSED IN A THERMAL CONTROL CANISTER MOUNTED ON THE INSTRUMENT POINTING SYSTEM (IPS). THE TELESCOPE HAS AN OCCULTING MIRROR AT THE PRIMARY FOCUS THAT REFLECTS AWAY ALL BUT A 5 X 15 ARC-MIN PORTION OF THE SOLAR IMAGE THAT THEN PASSES THROUGH AN APERTURE TO STRIKE A SECONDARY MIRROR THAT RE-IMAGES IT ONTO THE UV WADSWORTH SPECTROGRAPHIC SLIT PLATE. THE SECONDARY MIRROR RECEIVES LESS THAN ONE SOLAR CONSTANT OF ILLUMINATION. THE SPECTRAL RESOLUTION IS 50 MILLANGSTROMS AND THE SPATIAL RESOLUTION IS 3 ARC-SE. THE ROLL FILM CAMERA HOLDS 1000 EXPOSURES OF TYPE 101 FILM.

----- SPACELAB 2, BRUECKNER-----

INVESTIGATION NAME- SOLAR UV SPECTRAL IRRADIANCE MONITOR (SUSIM)

NSSDC ID- SPALAB2-11 INVESTIGATIVE PROGRAM CODE 87

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER  
OI - J.D.F. BARTOE  
OI - D.K. PRINZ  
OI - M.E. VAN HOOSIER

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) IMPROVE THE ACCURACY OF KNOWLEDGE OF THE ABSOLUTE SOLAR FLUXES; (2) TO PROVIDE A HIGHLY ACCURATE TRACEABILITY OF SOLAR FLUXES TO A VARIETY OF UV RADIATION STANDARDS TO ESTABLISH LONG-TERM (SOLAR CYCLE) VARIATIONS; AND (3) TO MEASURE THE VARIABILITY OF SOLAR FLUXES IN THE WAVELENGTH RANGE OF 120-400 NANOMETERS DURING SEVERAL TIME PERIODS, RANGING FROM FLARE-PRODUCED CHANGES TO

THE VARIABILITY FROM SOLAR ROTATION. IT IS DESIRED TO (A) IMPROVE THE ABSOLUTE ACCURACY OF SOLAR CONTINUUM IRRADIANCE MEASUREMENTS IN THIS WAVELENGTH RANGE WITH A GOAL OF PLUS OR MINUS 6 TO 10 PERCENT (WAVELENGTH-DEPENDENT); (B) MEASURE WITH HIGH ACCURACY THE INTENSITIES OF THE CONTINUUM BELOW 200 NANOMETERS RELATIVE TO THE INTENSITIES OF THE CONTINUUM ABOVE 200 NANOMETERS WITH A GOAL OF PLUS OR MINUS 1 PERCENT; (C) PERFORM HIGH ACCURACY MEASUREMENTS OF THE INTENSITIES OF SOLAR EMISSION LINES RELATIVE TO THE STABLE SOLAR CONTINUUM ABOVE 200 NANOMETERS WITH A GOAL OF PLUS OR MINUS 1 TO 5 PERCENT (WAVELENGTH-DEPENDENT); AND (D) IMPROVE THE ABSOLUTE ACCURACY OF SOLAR EMISSION LINE IRRADIANCE MEASUREMENTS IN THE 120- TO 400-NANOMETER REGION WITH A GOAL OF PLUS OR MINUS 6 TO 10 PERCENT (WAVELENGTH-DEPENDENT). THE INSTRUMENTATION CONSISTS OF A SOLAR UV SPECTRAL IRRADIANCE MONITOR. THE MONITOR CONSISTS OF TWO IDENTICAL DOUBLE-DISPERSION SCANNING SPECTROMETERS, SEVEN DETECTORS (FIVE PHOTODIODES AND TWO PHOTON COUNTERS), AND A UV CALIBRATION LIGHT SOURCE. THEY ARE SEALED IN A CANISTER FILLED WITH 1.1 ATM OF ARGON TO ELIMINATE THE EFFECTS OF CONTAMINATION FROM HIGH VACUUM OUTGASSING. ONE SPECTROMETER IS USED ALMOST CONTINUOUSLY DURING THE DAYLIGHT PORTION OF THE SOLAR-POINTED ORBIT FOR MEASURING SHORT-TIME VARIATIONS OF THE UV SOLAR FLUX (FLARE-RELATED AND SLOWLY-VARYING COMPONENT). THE OTHER SPECTROMETER IS USED ONLY ONCE A DAY TO TRACK ANY CHANGE IN SENSITIVITY OF THE FIRST SPECTROMETER. TWO OF THE FIVE PHOTODIODES ARE USED ONLY ONCE A DAY. A DEUTERIUM LAMP CALIBRATED IN SPECTRAL IRRADIANCE IS USED AS THE TRANSFER STANDARD SOURCE FOR DAILY IN-FLIGHT CALIBRATION AND STABILITY TRACKING OF BOTH SPECTROMETERS AND ALL SEVEN DETECTORS. THE TWO PHOTON COUNTERS OBTAIN A SPECTRAL RESOLUTION OF 0.1 NANOMETERS OVER THE WHOLE WAVELENGTH RANGE, WHILE 9-NANOMETER RESOLUTION IS OBTAINED WITH THE FIVE PHOTODIODES. A MICROPROCESSOR CONTROLS ALL INSTRUMENT FUNCTIONS BY PROGRAM INSTRUCTION. CHANNELS MONITOR THE 121.6-NANOMETER LINE (IN ALPHA) AND SEVEN SEGMENTS OF THE CONTINUUM FROM 149 TO 390 NANOMETERS. EIGHT NARROW-BAND CHANNELS (0.1-NANOMETER RESOLUTION) ARE MONITORED CONTINUOUSLY AND SCANNED IN FIVE 0.1-NANOMETER STEPS. IN THE SPECTRAL SCAN MODE (ONCE A DAY) THE SPECTRUM FROM 120 TO 400 NANOMETERS IS SCANNED AT 0.1-NANOMETER RESOLUTION. IN THE NARROW-BAND MODE THE SOLAR SPECTRUM AND THE DEUTERIUM LAMP ARE SCANNED WITH BOTH SPECTROMETERS; BOTH ARE MONITORED IN THE BROAD-BAND MODE.

#### ----- SPACELAB 2: COULES -----

INVESTIGATION NAME- INTERACTION OF OXYGEN AND GRAVITY  
INFLUENCED LIGNIFICATION

NSSDC ID- SPALAB2-02

INVESTIGATIVE PROGRAM  
CODE SD

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - J.R. COULES  
OI - H.W. SCHULD

U OF HOUSTON  
U OF HOUSTON

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO ESTABLISH THE EFFECT OF OXYGEN ON LIGNIN FORMATION IN PLANT TISSUE SUBJECTED TO A WEIGHTLESS ENVIRONMENT AND TO MEASURE THE RELATIVE AMOUNT OF AROMATIC BIOSYNTHESIS UNDER DIFFERENT OXYGEN ENVIRONMENTS. THE INVESTIGATION DISTINGUISHES BETWEEN TWO KNOWN FACTORS, OXYGEN AND GRAVITY, THAT INFLUENCE LIGNIFICATION IN PLANTS. SELECTED PREGERMINATED SEEDS ARE PLANTED IN METABOLIC CHAMBERS AND GERMINATED JUST PRIOR TO LAUNCH. CHAMBERS ARE CLOSED AND THE ATMOSPHERIC COMPOSITION IS ADJUSTED BY FLUSHING KNOWN GAS MIXTURES THROUGH RUBBER SEPTA IN THE CHAMBER WALLS. THE O<sub>2</sub> CONCENTRATIONS ARE 21 PERCENT (FOR THE CONTROL), 10 PERCENT, AND 3 PERCENT. EACH OXYGEN CONCENTRATION IS DUPLICATED IN ANOTHER CHAMBER MODULE. MERCURY VAPOR LAMPS ARE USED TO SIMULATE SUNLIGHT DURING PROGRAMMED DAY/NIGHT CYCLES THROUGHOUT THE MISSION. THE INVESTIGATION IS ALSO DUPLICATED ON EARTH AT 1 GRAVITY AND ON A CLINOSTAT (GROUND CONTROLS).

#### ----- SPACELAB 2: FAZIO -----

INVESTIGATION NAME- SMALL, HELIUM-COOLING INFRARED TELESCOPE

NSSDC ID- SPALAB2-03

INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
DUST  
ZOONACAL LIGHT  
ASTRONOMY

PERSONNEL

PI - G.G. FAZIO  
OI - W.F. HOFFMANN  
OI - D.E. KLEINMANN  
OI - F.J. LOU  
OI - G.H. RIEKE  
OI - W.A. TRAUB  
OI - E.W. URBAN

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NASA-HSF

BRIEF DESCRIPTION

THIS MULTIDISCIPLINARY INVESTIGATION INVOLVES BOTH SCIENTIFIC AND TECHNICAL GOALS. THE SCIENTIFIC OBJECTIVES ARE THE: (1) MEASUREMENT AND MAPPING OF EXTENDED LOW-SURFACE BRIGHTNESS INFRARED EMISSION FROM THE GALAXY. THE EXPERIMENT IS 500 TIMES MORE SENSITIVE THAN CURRENT BALLOON EXPERIMENTS AT 900 MICROMETERS, THUS MAKING POSSIBLE EXTENSIVE MEASUREMENT OF QUANTITY, DISTRIBUTION AND TEMPERATURES OF GALACTIC DUST AND STRUCTURES; (2) MEASUREMENT OF DIFFUSE EMISSION FROM INTERGALACTIC MATERIAL AND/OR GALAXIES AND QUASARS; (3) MEASUREMENT OF THE ZODIACAL DUST EMISSION, ESPECIALLY IF THE H<sub>2</sub>O COLUMN DENSITY CAN BE HELD TO LESS THAN 1.E-12 MOLECULES/CM<sup>2</sup>; AND (4) MEASUREMENT OF A LARGE NUMBER OF DISCRETE INFRARED SOURCES THAT OVERLAP WITH THE IRAS RESULTS. SPATIAL FILTERING PROVIDED MEASUREMENTS OF THE FLUX, SPECTRAL CHARACTERISTICS, POSITIONS, AND SIZES OF DISCRETE SOURCES WITH HIGH SENSITIVITY. TECHNICAL OBJECTIVES CONCERNED WITH THE MEASUREMENT OF THE NATURAL AND SPACECRAFT-INDUCED INFRARED BACKGROUND AND THE DETERMINATION OF SUITABLE TECHNIQUES FOR THE IN-SPACE USE OF SUPERFLUID HELIUM AND CRYOGENIC TELESCOPES ARE: (1) TO TAKE ENVIRONMENTAL MEASUREMENTS OF H<sub>2</sub>O, CO<sub>2</sub> (AND OTHER INFRARED-ACTIVE MOLECULES), DUST PARTICLES, THE EFFECTS OF MOLECULAR DEPOSITION AND COSMIC RAYS, AND THE EFFECTS FROM THE SHUTTLE ENVIRONMENT ON THE PERFORMANCE OF COOLED INFRARED TELESCOPES; (2) TO PROVE OUT THE DESIGN OF COOLED INFRARED TELESCOPES; AND (3) TO DEMONSTRATE THE PERFORMANCE OF A LARGE SUPERFLUID HELIUM DEWAR SYSTEM AND MEASURE CERTAIN PROPERTIES OF IT IN SPACE. THE INSTRUMENTATION CONSISTS OF A SMALL HERSCHELIAN TELESCOPE (15 CM DIAMETER WITH AN F/4 OFF AXIS) COOLED TO 3 DEG K. IT SCANS AT THE RATE OF 6 DEG/S AND COVERS A 90-DEG ARC ACROSS THE SKY. THE FOCAL PLANE CONTAINS 10 DETECTORS, 9 OF WHICH COVER THE REGION FROM 4 TO 120 MICROMETERS IN THREE NON-OVERLAPPING BROADBANDS (4 TO 9, 12 TO 24, AND 50 TO 120 MICROMETERS). ONE DETECTOR HAS A NARROW-BAND RESPONSE AT THE H<sub>2</sub>O AND CO<sub>2</sub> BAND LOCATIONS (6 TO 7 AND 14 TO 16 MICROMETERS). THEY COVER A FULL 3 DEG PERPENDICULAR TO THE SCAN DIRECTION. THERE IS ALSO A ROVABLE COLD SHUTTER TO PROVIDE AN ABSOLUTE ZERO FLUX REFERENCE FOR EACH BAND. THE STORED LIQUID HELIUM COOLING SYSTEM IS COMPOSED OF A LIQUID HELIUM DEWAR CONTAINING LIQUID HELIUM AT 1.3 K, A TRANSFER LINE ASSEMBLY, A VAPOR-COOLED TELESCOPE CRYOSTAT, AND A CRYOSTAT VACUUM COVER.

#### ----- SPACELAB 2: GABRIEL -----

INVESTIGATION NAME- SOLAR CORONAL HELIUM ABUNDANCE

NSSDC ID- SPALAB2-04

INVESTIGATIVE PROGRAM  
CODE ST/CD-OP

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS

PERSONNEL

PI - A.M. GABRIEL  
PI - J.L. CULHANE  
OI - D.E. PATCHETT  
OI - K. STRONG

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BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) DETERMINE THE RELATIVE ABUNDANCE OF HELIUM TO HYDROGEN IN THE SOLAR CORONA FROM THE MEASUREMENT OF THE PHOTOEXCITATION OF HYDROGEN LYMAN ALPHA 121.6 NANOMETERS AND HELIUM II AT 30.4 NANOMETERS; (2) DETERMINE THE FUNDAMENTAL PARAMETERS OF THE CORONAL PLASMA SUCH AS ELECTRON DENSITY, TEMPERATURE, AND IONIZATION BALANCE AS A FUNCTION OF RADIAL DISTANCE ABOVE THE LIMB; (3) CONSTRUCT A CONTOUR MAP IN THE INTENSITY OF SELECTED EXTREME UV LINES AND IN PHYSICAL PARAMETERS (ELECTRON TEMPERATURE AND DENSITY) OF CORONAL FEATURES WITH 15 ARC-S RESOLUTION BOTH ON THE DISK AND ABOVE THE LIMB OF THE SUN. THE INSTRUMENTATION IS COMPOSED OF A 1-M GRAZING-INCIDENCE SPECTROMETER USING A 1200-LINE/MM RULES GRATING. THE SUN'S IMAGE IS FOCUSED ONTO THE ENTRANCE SLIT PLANE BY MEANS OF A 20-CM FOCAL LENGTH GRAZING-INCIDENCE TELESCOPE OF WOLTER TYPE I SECTOR DESIGN. THE SLIT IS ORIENTED TANGENTIALLY TO THE SOLAR LIMB AND CAN BE STEPPED RADIALLY IN STEPS OF 1 ARC-MIN FROM A POSITION ON THE SOLAR DISK TO 8 ARC-MIN ABOVE THE LIMB BY A SERVO-DRIVEN LINEAR TRAVERSE ON THE TELESCOPE MIRROR. TWELVE CHANNEL ELECTRON MULTIPLIERS ARE POSITIONED BEHIND DIFFERENT EXIT SLITS AT PRE-SELECTED SPECTRAL POSITIONS ON THE ROLLAND CIRCLE. TWO POSITIONS ARE AT 121.6 NANOMETERS AND 30.4 NANOMETERS (FOR H/HE ABUNDANCES). THE OTHER SLITS COVER ASSOCIATED PARAMETERS SUCH AS THE TEMPERATURE AND DENSITY OF THE SOLAR ATMOSPHERE. SOME SLITS HAVE ATTENUATING FILTERS FOR DYNAMIC RANGE OF THE RATIO OF THE DISK INTENSITY TO THAT OF THE CORONA AT 3.5.E5 KM. FILTERS ARE REMOVED FOR LIMB MEASUREMENTS. A SMALL OSCILLATORY ROTATION OF THE GRATING ABOUT AN AXIS THROUGH THE ENTRANCE SLIT PERMITS A SMALL WAVELENGTH SCAN TO DISCRIMINATE AGAINST SCATTERED STRAY LIGHT. AN AUXILIARY INSTRUMENT MONITORS CHANGES IN HE II 30.4 NANOMETER INTENSITY CAUSED BY ATMOSPHERIC ABSORPTION EFFECTS RESULTING FROM SPACECRAFT HEIGHT OR CHANGES OF LINE-OF-SIGHT TO THE SUN. A ZERO-ORDER DETECTOR MONITORS THE SOLAR LIMB CROSSINGS AND GIVES DATA ON SHORT-TERM INTENSITY VARIATIONS IN STARS FOR WAVELENGTHS SHORTER THAN 140 NANOMETERS. SIGNALS ARE COUNTED, MULTIPLEXED, AND INTERFACE WITH THE SPACELAB TELEMETRY SYSTEM FOR TRANSMISSION TO THE GROUND. THE POINTING ACCURACY IS 15 ARC-S AND THE POINTING STABILITY IS 9 ARC-S.

----- SPACELAB 2: LANGE -----

INVESTIGATION NAME- IN-ORBIT CALIBRATION OF LOW-G MINIATURE ELECTROSTATIC ACCELEROMETER

NSSDC ID- SPALAB2-12 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
TECHNOLOGY

PERSONNEL  
PI - W.G. LANGE

BELL AEROSPACE CORP

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE THUS: (1) EVALUATION OF THE SPACELAB 2 ORBITAL LOW-GRAVITY ACCELERATION ENVIRONMENT IN PLANNED MODES OF OPERATION; (2) EVALUATION OF THE SPACELAB 2 CAPABILITY AS A LOW-GRAVITY TEST FACILITY; AND (3) CALIBRATION AND EVALUATION OF THE IN-ORBIT PERFORMANCE OF THE MINIATURE ELECTROSTATIC ACCELEROMETER (MEAS) AS MODIFIED FOR 3-AXIS ACCELERATION MEASUREMENT CAPABILITY. THE INSTRUMENTATION CONSISTS OF A 3-AXIS MINIATURE ELECTROSTATIC ACCELEROMETER MOUNTED ON A ROTATING TABLE THAT INTRODUCES A VARIABLE AND CONTROLLABLE CENTRIPETAL ACCELERATION ALONG THE INPUT AXIS. THE TABLE ALSO PROVIDES MODULATION OF THE SENSED ACCELERATIONS, SHIFTING THE SIGNAL TO A LOW-NOISE REGION OF THE POWER DENSITY SPECTRUM. ONE OR MORE FIXED POSITIONS ARE USED TO MEASURE ALONG PREFERRED AXES. CALIBRATION REQUIRES THAT A KNOWN ACCELERATION BE INTRODUCED ALONG ITS INPUT AXIS. THIS CAN BE ACCOMPLISHED BY GRAVITY GRADIENT, MASS ATTRACTION, OR A SLOWLY ROTATING TABLE. THE LATTER IS USED BECAUSE IT HAS A LARGE NUMBER OF DIFFERENT ACCELERATION LEVELS THAT CAN BE PRODUCED BY VARYING THE ROTATION SPEED. VEHICLE ANGULAR RATES AND ORBITAL DRAG ARE FREQUENTLY MODULATED. A CALIBRATION, A TABLE-ROTATING, AND A TABLE-FIXED MODE ARE INCLUDED. THE MEASUREMENT PERIOD FOR ROTATION RATES USED VARIES FROM 10 S AT 1.6-G GRAVITY TO 1000 S AT 1.6-G GRAVITY.

----- SPACELAB 2: MASON -----

INVESTIGATION NAME- DYNAMICS AND THERMAL PROPERTIES OF SUPERFLUID HELIUM IN ZERO-G

NSSDC ID- SPALAB2-13 INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - P.V. MASON  
OI - D.J. COLLINS  
OI - D.D. ELLERMAN  
OI - D. PETRAC  
OI - M.H. SAFFREN  
OI - T.G. WANG

NASA-JPL  
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NASA-JPL

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO DETERMINE THE FLUID AND THERMAL PROPERTIES REQUIRED FOR THE DESIGN OF PLANNED SPACE EXPERIMENTS USING SUPERFLUID HELIUM (2.2 K) AS A CRYOGEN, TO ADVANCE SCIENTIFIC UNDERSTANDING OF THE INTERACTIONS BETWEEN SUPERFLUID AND NORMAL LIQUID HELIUM, AND TO DEMONSTRATE THE USE OF SUPERFLUID HELIUM AS A CRYOGEN IN ZERO GRAVITY. SPECIFICALLY, THE OBJECTIVES ARE TO: (1) TAKE DETAILED MEASUREMENTS OF LOW-FREQUENCY SLCM MODES OF SUPERFLUID HELIUM; (2) TAKE PRECISE MEASUREMENTS OF THE THERMAL FLUCTUATIONS AND DISTRIBUTIONS IN SUPERFLUID HELIUM IN ZERO GRAVITY. THE INVESTIGATION PERFORMS AT THE MICROKELVIN LEVEL OVER A FREQUENCY RANGE FROM 0-100 MHz; (3) DEVELOP AN APPARATUS TO MEASURE THE VELOCITIES AND ATTENUATION OF QUANTIZED SURFACE WAVES IN SUPERFLUID FILMS IN FREQUENCIES SO HIGH THAT SURFACE TENSION FORCES DOMINATE OVER GRAVITY FORCES AND ATTENUATION EFFECTS ON EARTH PRECLUDE THEIR MEASUREMENTS; AND (4) OBTAIN SUPERFLUID HELIUM CRYOSTAT PERFORMANCE DATA FOR FUTURE SPACE APPLICATIONS. THE INSTRUMENTATION CONSISTS OF AN INSTRUMENTED CRYOSTAT (CONTAINING AN INVESTIGATION PACKAGE INSIDE) AND A SUPPORT ELECTRONICS PACKAGE. THE CAVITY IS SURROUNDED BY A 40-LITER SUPERFLUID HELIUM TOROID AND A MULTILAYER SUPER INSULATION SYSTEM SPACED BY HELIUM VAPOR-COOLED SHIELDS. THE DEWAR OPERATES IN BOTH UPRIGHT AND HORIZONTAL CONFIGURATIONS. THE CRYOSTAT IS INSTRUMENTED WITH GERMANIUM AND THERMOCOUPLE TEMPERATURE SENSORS TO MONITOR THE CHAMBER TEMPERATURES AND THE SUPERFLUID PLUG AND INSULATION PERFORMANCE. ACCELEROMETERS MONITOR VIBRATION EFFECTS IN ORDER TO CROSS-CORRELATE WITH THE BULK BEHAVIOR OBSERVATIONS.

----- SPACELAB 2: MENDILLO -----

INVESTIGATION NAME- PLASMA DEPLETION EXPERIMENTS FOR IONOSPHERIC AND RADIO ASTRONOMICAL STUDY

NSSDC ID- SPALAB2-04 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - M. MENDILLO  
PI - A.V. BARBOZA  
OI - M.B. PAPAGIANNIS  
OI - R.C. BELLET  
OI - R.A. HELLIWELL  
OI - P.A. BERNHARDT  
OI - W.B. PONGRATZ  
OI - G.R. SMITH  
OI - D.J. BAKER  
OI - R.B. HARRIS  
OI - D.T. FARLEY  
OI - D. ANDERSON

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CORNELL U  
NOAA-SEL

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) STUDY THE IONOSPHERIC F-REGION DEPLETION AND RELATED EFFECTS CAUSED BY SHUTTLE THRUSTER FIRINGS IN MID-LATITUDES; (2) DETERMINE THE NATURE OF THE PHYSICAL PROCESSES GOVERNING THE IONOSPHERIC STRUCTURE, INCLUDING DIFFUSION COEFFICIENTS, CHEMICAL REACTION RATES, NEUTRAL WIND VELOCITIES, ELECTRIC FIELDS, ELECTRON COOLING RATES, AND LIMITING FLUXES; (3) PRODUCE CONTROLLED PERTURBATIONS IN THE PLASMAPAUSE TO EXAMINE THE FORMATION OF ARTIFICIAL VLF DUCTS AND THE EQUATORIAL SPREAD F; AND (4) USE THE IONOSPHERIC DEPLETION REGION (IDR) TO CONDUCT GROUND-BASED HIGH-RESOLUTION RADIO ASTRONOMICAL STUDIES. DURING FLIGHT, THRUST FIRINGS FROM THE ORBITAL MANEUVERING SYSTEM RELEASE A MINIMUM OF 200 KG OF EXHAUST VAPORS OVER EACH OF THE RADIO ASTRONOMICAL SITES OF WESTFORD, MAS ARECIBO, PUERTO RICO; ROEVAL, QUEBEC; JICAMARCA, PERU AND HOBART, AUSTRALIA. AIRBLOW OBSERVATIONS ARE ATTEMPTED WITH A HIGH-RESOLUTION FABRY-PEROT INTERFEROMETER AT 630 NANOMETERS CAPABLE OF DISCRIMINATING BETWEEN ATMOSPHERIC EMISSIONS AND SOLAR BACKGROUND RADIATION. RADAR AND OPTICAL MEANS ARE USED TO MEASURE TEMPERATURE FLUCTUATIONS AND ION DENSITY WHILE ELECTRON CONTENT MEASUREMENTS ARE MADE FROM SATELLITE SIGNALS PASSING THROUGH THE MOBILIZED REGION. VLF PROPAGATION EFFECTS ARE EXAMINED BETWEEN ROEVAL, QUEBEC AND SIPLE, ANTARCTICA TO MEASURE THE EFFECTS OF ARTIFICIALLY PRODUCED F-REGION GRADIENTS ON THE IONOSPHERIC PROPAGATION OF VLF SIGNALS. COLUMNAR ELECTRON CONTENT MEASUREMENTS ARE CONDUCTED USING POLARIMETERS IN CONJUNCTION WITH GEOSTATIONARY SATELLITE BEACONS. OPTICAL OBSERVATIONS PROVIDE INFORMATION ON LOW-LATITUDE NEUTRAL WIND VELOCITIES AND ELECTRIC FIELDS. LOW-FREQUENCY RADIO ASTRONOMY OBSERVATIONS MEASURE THE GALACTIC RADIO NOISE IN THE 1 TO 5 MHz RANGE, WHERE THE PEAK OF GALACTIC EMISSION OCCURS, AND INTRIGUING RADIO SOURCES, E.G. VELA AND GEM NEBULAE.

----- SPACELAB 2: NEVER -----

INVESTIGATION NAME- ELEMENTAL COMPOSITION AND ENERGY SPECTRA OF COSMIC RAY NUCLES

NSSDC ID- SPALAB2-06

INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
COSMIC RAYS

PERSONNEL

PI - P. REVER  
PI - D. MULLER  
OI - J.E. LAMPORT  
OI - J. L'HEUREUX

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U OF CHICAGO

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO MAKE A PRECISE DETERMINATION OF THE CHARGE COMPOSITION AND INDIVIDUAL ENERGY SPECTRA OF COSMIC RAY NUCLES FROM LITHIUM TO IRON COVERING THE ENERGY RANGE FROM 50 TO 2000 GEV/NUCLEON. THE INVESTIGATION EXPOSES TO DEEP SPACE AN INSTRUMENT OF LARGE VOLUME AND CONSIDERABLE MASS FOR AN EXTENDED TIME PERIOD WITHOUT THE INFLUENCE OF AN OVERLYING ATMOSPHERE. THE INSTRUMENT FOR CHARGE COMPOSITION IS A TELESCOPE OF TWO PLASTIC SCINTILLATORS FOR THE ENERGY MEASUREMENTS TWO GAS CERENKOV COUNTERS COVERING THE RANGE FROM 50 TO 150 GEV/NUCLEON AND A TRANSITION RADIATION DETECTOR SYSTEM FOR THE REGION FROM 400 TO 2000 GEV/NUCLEON ARE USED. THE DETECTOR ELEMENTS ARE CONTAINED IN A CYLINDRICAL PRESSURIZED SHELL WITH HEMISPHERICAL TOP AND BOTTOM COVERS (2.8 M IN DIAMETER WITH A MAXIMUM HEIGHT OF 3.7 M). ALL DETECTOR ELEMENTS OCCUPY AREAS 2 X 2 M. THE TRANSITION RADIATION DETECTOR CONSISTS OF SIX RADIATORS (WITH A TOTAL OF 16,000 PLASTIC FOILS OF 5-MICROMETER THICKNESS) AND SIX BENON-FILLED MULTIWIRE PROPORTIONAL CHAMBERS AND IS POSITIONED IN THE CENTER OF THE INSTRUMENT. TWO SCINTILLATORS ARE ADJACENT TO BOTH ENDS AND ARE HOUSED IN LIGHT INTEGRATION BOXES. THE TWO GAS CERENKOV COUNTERS FILL THE REMAINING SPACE BETWEEN THE SCINTILLATORS AND HEMISPHERICAL LIDS OF THE PRESSURIZED CONTAINER. THEY ARE FILLED WITH GASES AT ATMOSPHERIC PRESSURE AND THE INNER WALLS ARE COATED WITH WHITE HIGHLY REFLECTIVE PAINT. THERE IS A GEOMETRIC FACTOR OF 9.50 M<sup>2</sup>SR FOR THE TRANSITION DETECTOR AND 1.50 M<sup>2</sup>SR FOR THE CERENKOV COUNTER TELESCOPE. TO DETECT THE LIGHT OF AN INCIDENT PARTICLE, 20 PHOTOMULTIPLIER TUBES WITH PHOTOEATHODES 12.7 CM (5 IN.) IN DIAMETER ARE USED. FAST 5.08-CM (2-IN.) PHOTOMULTIPLIERS ARE COUPLED DIRECTLY TO THE SCINTILLATORS, WHICH ARE USED FOR TIME DELAYS BETWEEN RESPONSES RECORDED BY EACH SCINTILLATOR. PARTICLES MUST PENETRATE BOTH CERENKOV RADIATION IS DETECTED BY SD TUBES WITH 12.7-CM (5-IN.) WINDOWS. AN ELECTRONICS PACKAGE COLLECTS THE INFORMATION FROM THE VARIOUS SENSORS AND FORWARDS IT FOR GROUND TRANSMISSION.

----- SPACELAB 2, SCHNOES -----

INVESTIGATION NAME - VITAMIN D METABOLITES AND BONE  
DEMINERALIZATION

NSSDC ID - SPALAB2-01 INVESTIGATIVE PROGRAM  
CODE SC

INVESTIGATION DISCIPLINE(S)  
SPACE BIOLOGY

PERSONNEL

PI - H.K. SCHNOES U OF WISCONSIN  
OI - M.F. DE LUCA U OF WISCONSIN  
OI - E. HOLTON NASA-ARC

BRIEF DESCRIPTION

THIS EXPERIMENT WILL MEASURE QUANTITATIVELY THE BLOOD LEVELS OF BIOLOGICALLY ACTIVE VITAMIN D METABOLITES OF THE FLIGHT CREW MEMBERS TO ESTABLISH WHETHER THESE DERANGEMENTS OF MINERAL (SPECIFICALLY CALCIUM) METABOLISM REFLECT THEMSELVES IN ANY WAY IN A MODULATION OF VITAMIN D METABOLISM TO ITS VARIOUS METABOLITES. THE EXPERIMENT IS COMPOSED OF A DEVELOPMENTAL PHASE AND A FINAL PHASE. AS PART OF THE DEVELOPMENTAL PHASE, EXISTING ANALYSIS METHODS FOR THE VITAMIN D METABOLITES WILL BE REFINED AND NEW METHODS DEVELOPED. THE FINAL PHASE WILL CONSIST OF THE QUANTITATIVE ANALYSIS OF THE VITAMIN D METABOLITES IN PLASMA SAMPLES OF THE SPACELAB 2 CREW COLLECTED PRIOR TO, DURING, AND POST FLIGHT. FLIGHT HARDWARE CONSISTS OF TWO BLOOD COLLECTION KITS, A CENTRIFUGE TO PREPARE THE PLASMA, AND A -20 DEG C FREEZER FOR SAMPLE STORAGE. ALL THE EQUIPMENT WILL BE LOCATED IN THE ORBITER MID-DECK.

----- SPACELAB 2, SHAWHAN -----

INVESTIGATION NAME - EJECTABLE PLASMA DIAGNOSTICS PACKAGE

NSSDC ID - SPALAB2-03 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.D. SHAWHAN U OF IOWA  
OI - L.A. FRANK U OF IOWA  
OI - D.A. GURNETT U OF IOWA  
OI - N. D'ANGELO U OF IOWA  
OI - H.C. BRINTON NASA-GSFC

BRIEF DESCRIPTION

THE PLASMA DIAGNOSTIC PACKAGE (PDP) IS A FULLY INSTRUMENTED EJECTABLE SUBSATELLITE. DURING THE MISSION IT WILL OPERATE WITHIN THE PAYLOAD BAY, ON THE REMOTE MANIPULATOR SYSTEM (RMS), AND AS A FREE FLYER. THE OBJECTIVES INCLUDE: (1) TO STUDY ORBIETE-MAGNETOPLASMA INTERACTIONS IN TERMS OF DENSITY WAVES, DC ELECTRIC FIELDS, ENERGIZED PLASMA, AND A VARIETY OF POSSIBLE WAVE-PARTICLE INSTABILITIES; (2) TO PROVIDE IN SITU MEASUREMENTS OF THE IONOSPHERIC PLASMA 'HOLES' INDUCED BY THE ORBITER ENGINE BURNS IN SUPPORT OF THE GROUND RADAR OBSERVATIONS OF SPACELAB 2 EXPERIMENT 4 (SPALAB2-04); (3) TO MEASURE FIELDS, WAVES, AND PLASMA MODIFICATIONS INDUCED BY THE ORBITER/SPACELAB OPERATING SYSTEMS IN THE SPACELAB BAY AND OUT TO DISTANCES OF 10 KM; AND (4) TO OBSERVE NATURAL WAVES, FIELDS, AND PLASMAS IN THE UNPERTURBED MAGNETOSPHERE. INSTRUMENTS TO BE FLOWN INCLUDE: (1) A QUADRISPHERICAL LOW ENERGY PROTON AND ELECTRON DIFFERENTIAL ANALYZER-ELECTRON AND PROTON DISTRIBUTION FUNCTIONS FROM 2 EV TO 50 KEV; (2) A PLASMA WAVE ANALYZER/ELECTRIC DIPOLE AND MAGNETIC SEARCH COIL SENSORS-COMPONENTS OF ELECTROSTATIC AND ELECTROMAGNETIC WAVES FROM 5 Hz TO 30 MHZ; (3) A DC ELECTRIC FIELD METER FOR SENSING COMPONENTS OF THE DC ELECTRIC FIELD OVER THE RANGE FROM 2 TO 2000 MV/M; (4) A TRIAXIAL FLUXGATE MAGNETOMETER TO MEASURE THE DC MAGNETIC FIELD DISTRIBUTION IN THE VICINITY OF THE ORBITER; (5) A LANGMUIR PROBE TO MEASURE ELECTRON DENSITY IN THE REGION 1.64 TO 1.67 PER CU CM AND ELECTRON TEMPERATURE FROM 500 TO 5000 DEG K; (6) A RETARDING POTENTIAL ANALYZER AND DIFFERENTIAL FLUX ANALYZER TO DETERMINE THE ENERGY DISTRIBUTION AND STREAMING VELOCITY DIRECTION FOR PLASMA IONS WITH ENERGIES LT. 16 EV, NUMBER DENSITIES OF 1.E2 TO 1.E7 PER CU CM, TEMPERATURES FROM 500 TO 1.66 DEG K, AND VELOCITIES UP TO 15 KM/S WITHIN PLUS OR MINUS 50 DEG OF THE INSTRUMENT PLANE; AND (7) AN ION MASS SPECTROMETER FOR MEASURING FROM 1 TO 64 AMU AND DENSITIES OF 20 TO 2.66 PER CU CM. IN ADDITION TO THE PDP, THE EXPERIMENT CONSISTS OF A SPECIAL PURPOSE END EFFECTOR, A RELEASE MECHANISM, A RECEIVER AND DATA PROCESSING ASSEMBLY, AND AN R.F. ANTENNA ASSEMBLY.

----- SPACELAB 2, TITLE -----

INVESTIGATION NAME - SOLAR MAGNETIC AND VELOCITY FIELD MEASUREMENT SYSTEM

NSSDC ID - SPALAB2-08 INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS  
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.M. RAMSEY	TITLE	LOCKHEED PALO ALTO
OI - M.E. RAMSEY		LOCKHEED PALO ALTO
OI - R.C. SMITHSON		LOCKHEED PALO ALTO
OI - S.A. SCHOOLMAN		LOCKHEED PALO ALTO
OI - T.D. TARBELL		LOCKHEED PALO ALTO
OI - L.W. ACTON		LOCKHEED PALO ALTO
OI - W.C. LIVINGSTON		KITT PEAK NATL OBS
OI - J.B. HARVEY		KITT PEAK NATL OBS
OI - R.W. MILKEY		KITT PEAK NATL OBS
OI - G.U. SIMON		SACRAMENTO PEAK OBS
OI - S.P. WORDEN		SACRAMENTO PEAK OBS
OI - J.B. ZIRKER		SACRAMENTO PEAK OBS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) MEASURE MAGNETIC AND VELOCITY FIELDS IN THE SOLAR ATMOSPHERE WITH HIGH SPATIAL RESOLUTION AND REDUCE THE SMALL-SCALE STRUCTURE AND EVOLUTION OF THESE FIELDS ON THE 10-TO 20-MIN TIME SCALE OF SOLAR GRANULATIONS; (2) FOLLOW THE EVOLUTION OF SOLAR MAGNETIC STRUCTURES OVER PERIODS OF 20 TO 40 H IN ORDER TO DETERMINE HOW THE MAGNETIC ELEMENTS COUPLE TO THE SUPERGRANULE VELOCITY PATTERNS AND BY WHAT MECHANISMS FIELD DIFFUSION AND U/APPEARANCE OCCURS; (3) STUDY WITH HIGH TEMPORAL AND SPATIAL RESOLUTION THE MAGNETIC FIELD CHANGES ASSOCIATED WITH TRANSIENT EVENTS SUCH AS FLARES AND TO ISOLATE AND FOLLOW THE BIRTH OF SUNSPOTS, PCRS, AND EPHEMERAL REGIONS; (4) DEVELOP THE ELEMENTS OF AN H ALPHA MAGNETOGRAPH/TELESCOPE THAT CAN BE REFLOWN; AND (5) PROVIDE A TEST OF THE POINTING ACCURACY AND STABILITY OF THE INSTRUMENT POINTING SYSTEM (IPS) TO SUBARC-SECOND ACCURACY. THE INSTRUMENTATION CONSISTS OF A SOLAR OPTICAL UNIVERSAL POLARIMETER MOUNTED ON THE IPS. THE POLARIMETER IS COMPOSED OF A TUNABLE BIREFRINGENT FILTER WITH A BANDPASS OF 60 MILLANGSTROMS USING ASSOCIATED BLOCKING FILTERS TO PERMIT THE FILTER TO OPERATE IN EIGHT SPECTRAL BANDS, EACH ABOUT 0.8 NANOMETER WIDE. A FILM CAMERA TAKES DIRECT FILTERGRAMS THROUGH THE TUNABLE FILTER. A CHARGE INJECTION DEVICE (CID)-ARRAY CAMERA TAKES PHOTOELECTRIC FILTERGRAMS WITH A HIGH SIGNAL-TO-NOISE RATIO THROUGH THE TUNABLE FILTERS. A VIDEO PROCESSOR STORES IMAGES IN DIGITAL MEMORY AND A HIGH RESOLUTION WHITE LIGHT SYSTEM WITH FILM CAMERA AND VIDEO DISPLAY IS USED FOR ACQUISITION OF ACCURATE POINTING DATA. THE FILTER SYSTEMS ARE INTERFACE TO A 30-CM CASSEGRAIN TELESCOPE WITH OFFSET POINTING CAPABILITY. ROTATABLE WEDGES ARE PLACED IN FRONT OF THE TELESCOPE TO ALLOW IT TO OBSERVE ANY DESIRED POINT ON THE SUN. A GUIDER ASSEMBLY COMPENSATES FOR HIGH SPEED IMAGE MOTION. TO RECORD A COMPLETE LINE PROFILE FILTERGRAMS ARE TAKEN IN ORTHOGONAL POLARIZATIONS AT 15 WAVELENGTHS SPACED 2 TO 3.5 PICCIMETERS APART AND IN THE NEAR CONTINUUM. THEY ARE RECORDED ON SOILS FILM WITH A RESOLUTION ELEMENT OF 50 MICROMETERS PER SIDE.

----- SPACELAB 2, WILLMORE -----

INVESTIGATION NAME - HARD X-RAY IMAGING OF CLUSTERS OF GALAXIES AND OTHER EXTENDED X-RAY SOURCES

NSSDC ID - SPALAB2-07

INVESTIGATIVE PROGRAM  
CODE SC/CD-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY  
X-RAY ASTRONOMY

PERSONNEL

PI - A.P. WILLMORE	U OF BIRMINGHAM
OI - D.K. BEDFORD	U OF BIRMINGHAM
OI - G.F. CARPENTER	U OF BIRMINGHAM
OI - C.J. EYLES	U OF BIRMINGHAM
OI - J.R.H. HERRING	U OF BIRMINGHAM
OI - G.P. SIMMETT	U OF BIRMINGHAM
OI - G.K. SKINNER	U OF BIRMINGHAM
OI - J.W.G. WILSON	U OF BIRMINGHAM

BRIEF DESCRIPTION

THE PURPOSE OF THIS INVESTIGATION IS TO EXAMINE THE EMISSION FROM CLUSTERS OF GALAXIES IN ORDER TO STUDY THE MECHANISMS INVOLVED IN THEIR EMISSION AND THE POSSIBLE PRESENCE OF AN INTERGALACTIC GAS. THE SPATIAL AND SPECTRAL DISTRIBUTION OF X-RAY FLUX FROM THESE CLUSTERS IN THE ENERGY RANGE FROM 2 TO 20 KEY IS STUDIED. THE INVESTIGATION IS ALSO USED ON OTHER X-RAY SOURCES SUCH AS THOSE OCCURRING AT THE CENTER OF OUR GALAXY. THESE SOURCES ARE EXTREMELY WEAK AND REQUIRE A POINTING SYSTEM TO ACQUIRE SUFFICIENT OBSERVING TIME. THE INSTRUMENT IS A DOUBLE X-RAY TELESCOPE THAT USES A TECHNIQUE TO PRODUCE X-RAY IMAGES OF SMALL REGIONS OF THE SKY AT HIGHER X-RAY ENERGIES THAN IS POSSIBLE USING CONVENTIONAL METHODS. IT USES A CODED BINARY MASK AND A POSITION-SENSITIVE DETECTOR THAT PRODUCES AN X-RAY MAP OF THE SKY. THE MASK USES A SPECIAL CASE OF THE RANDOM PINHOLE MASK, WHICH PRODUCES AN IMAGE BY DECONVOLVING THE PATTERN OF THE MASK HOLES THAT PRODUCE A SHADOWGRAM ON THE POSITION-SENSITIVE DETECTOR WHEN ILLUMINATED BY RADIATION FROM THE OBJECT. THE TWO TELESCOPES HAVE DIFFERENT RESOLUTIONS. ONE HAS A COARSE RESOLUTION TO DETECT FAINT SOURCES AND AN EXTENDED REGION OF STRONGER SOURCES WHILE THE OTHER HAS A FINE RESOLUTION THAT RESOLVES FINE DETAILS IN MORE INTENSE REGIONS. THE VALUES ARE 12 X 12 ARC-MIN AND 3 X 3 ARC-MIN, RESPECTIVELY, AT FULL WIDTH HALF MAXIMUM OF THE RESPONSE AND DO NOT NECESSARILY IMPLY THE LIMITS TO THE FINENESS OF THE DETAIL THAT CAN BE REDUCED. THE DETECTORS ARE COMPOSED OF MULTIWIRE POSITION-SENSITIVE PROPORTIONAL COUNTERS. ANTI-COINCIDENCE TECHNIQUES ARE USED TO REJECT COSMIC RAY EVENTS. A MOTORIZED CIMBAL SYSTEM IS USED TO POINT THE TELESCOPE TO WITHIN 0.5 DEG OF ANY ORIENTATION WITH RESPECT TO

THE SHUTTLE. A MICROPROCESSOR SYSTEM ACCEPTS THE NOMINAL VEHICLE ATTITUDE TO SELECT A PREPROGRAMMED LIST OF TARGETS AND TO DRIVE THE TELESCOPES. A GYRO PACKAGE FOR POINTING, STAR SENSORS FOR DETERMINATION OF ABSOLUTE DIRECTIONS TO WITHIN 1 ARC-MIN., AND STAR FIELD CAMERAS FOR LONG-TERM DRIFT MOTION ARE ALSO PART OF THE INSTRUMENTATION.

\*\*\*\*\* SPACELAB 3 \*\*\*\*\*

**SPACECRAFT COMMON NAME - SPACELAB 3**

**ALTERNATE NAMES -**

**NSSDC ID - SPALAB3**

**LAUNCH DATE - 04/18/84** **WEIGHT - 14500. KG**  
**LAUNCH SITE - CAPE CANAVERAL, UNITED STATES**  
**LAUNCH VEHICLE - SHUTTLE**

**SPONSORING COUNTRY/AGENCY** **UNITED STATES** **NASA-OS**

**PLANNED ORBIT PARAMETERS**  
**ORBIT TYPE - GEOCENTRIC**  
**ORBIT PERIOD - 92. MIN**  
**PERIAPSIS - 370. KM ALT** **INCLINATION - 57. DEG**  
**APOAPSIS - 370. KM ALT**

**PERSONNEL**  
 MM - S. REINARTZ NASA-MSFC  
 MS - G.H. FICHTL NASA-MSFC  
 MG - R.G. NOBLITT NASA HEADQUARTERS  
 SC - J.S. THEON NASA HEADQUARTERS  
 PM - D.C. JEAN NASA-MSFC

**BRIEF DESCRIPTION**  
 SPACELAB 3 CONSISTS OF A SPACELAB LONG MODULE AND A PALLET. THE FOLLOWING INVESTIGATIONS ARE PLANNED BUT NOT YET CONFIRMED FOR FLIGHT: FLUID EXPERIMENT SYSTEM, VAPOR CRYSTAL GROWTH SYSTEM, DROP DYNAMICS MODULE (DDM) EXPERIMENTS, GEOPHYSICAL FLUID FLOW CELL (GFFC), RESEARCH ANIMAL HOLDING FACILITY, LIFE SCIENCES MINILAB, HALOGEN OCCULTATION EXPERIMENT (HALOE), ATMOSPHERIC TRACE MOLECULES OBSERVED BY SPECTROSCOPY (ATMOS), AND IONIZATION STATES OF SOLAR AND GALACTIC COSMIC RAY HEAVY NUCLEI.

\*\*\*\*\* SPACELAB 3, BISWAS \*\*\*\*\*

**INVESTIGATION NAME - IONIZATION STATES OF SOLAR AND GALACTIC COSMIC RAY HEAVY NUCLEI STUDIES**

**NSSDC ID - SPALAB3-15** **INVESTIGATIVE PROGRAM**  
**CODE ST**

**INVESTIGATION DISCIPLINE(S)**  
**COSMIC RAYS**  
**PARTICLES AND FIELDS**

**PERSONNEL**  
 PI - S. BISWAS TATA INST OF FUND RES  
 PI - D. LAL PHYSICAL RESEARCH LAB  
 OI - R. COWSIK TATA INST OF FUND RES  
 OI - N. DYRGAPRASAD TATA INST OF FUND RES  
 OI - V. VENKATAVARADAN TATA INST OF FUND RES  
 OI - S. SARKAR TATA INST OF FUND RES

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVES ARE TO MEASURE THE IONIZATION STATES OF HEAVY ELEMENTS (O TO Fe) IN SOLAR COSMIC RAYS AND THE LOW-ENERGY GALACTIC COSMIC-RAY IONIZATION STATES. THE DETECTOR MODULE CONSISTS OF A THIN UPPER STACK OF KODAK CELLULOSE NITRATE (CN) PLASTIC SHEETS, A LOWER STACK OF KODAK CN WITH LEXAN POLYCARBONATE SHEETS AT THE BOTTOM, AND AN ELECTRONIC DRIVE SYSTEM.

\*\*\*\*\* SPACELAB 3, FARMER \*\*\*\*\*

**INVESTIGATION NAME - ATMOSPHERIC TRACE MOLECULES OBSERVED BY SPECTROSCOPY (ATMOS)**

**NSSDC ID - SPALAB3-14** **INVESTIGATIVE PROGRAM**  
**CODE ST**

**INVESTIGATION DISCIPLINE(S)**  
**ATMOSPHERIC PHYSICS**  
**METEOROLOGY**

**PERSONNEL**  
 PI - C.B. FARMER NASA-JPL

**BRIEF DESCRIPTION**

THE PRIMARY PURPOSE OF THE ATMOSPHERIC TRACE MOLECULES OBSERVED BY SPECTROSCOPY (ATMOS) SL 3 EXPERIMENT IS TO DEMONSTRATE THE CAPABILITY TO MONITOR ENVIRONMENTAL QUALITY BY SURVEYING THE ATMOSPHERE FOR TRACE CONSTITUENTS AND IDENTIFYING THEIR SOURCES, FLOW PATTERNS, AND DECAY MECHANISMS. IN ITS MOST GENERAL FORM, THE ATMOS EXPERIMENT OBJECTIVE IS TO DETERMINE CONCENTRATION PROFILES THROUGH STRATOSPHERIC ALTITUDES (20 TO 80 KM) AT A VERTICAL RESOLUTION OF 2 KM. THE ATMOS INSTRUMENT VIEWS THE SUN THROUGH THE STRATOSPHERE AND MEASURES THE SPECTRAL ABSORPTION OF SOLAR ENERGY. EACH DATA-TAKING RUN IS INITIATED PRIOR TO THE SUN EMERGING FROM OR DISAPPEARING BEHIND THE EARTH. DATA FROM THE INSTRUMENT FOR THESE SUNRISE AND SUNSET LIMB ENCOUNTERS ARE INTERFEROGRAMS THAT, WHEN PROCESSED ON THE GROUND, PROVIDE ABSORPTION SPECTRA.

THE INSTRUMENT CONSISTS OF THE OPTICAL SENSOR AND THE ELECTRONICS PACKAGE. THE SUN TRACKER AUTOMATICALLY LOCKS ONTO THE SUN AND CORRECTS FOR ANY ORIENTATION CHANGE WITHIN PREDETERMINED LIMITS. THE ENERGY FROM THE SUN TRACKER IS DIRECTED INTO THE OPTICAL SYSTEM AND IS COLLECTED BY AN INFRARED DETECTOR. THE DETECTOR SIGNAL IS AMPLIFIED AND SENT TO THE ELECTRONICS. THESE DATA IN CONJUNCTION WITH ENGINEERING AND HOUSEKEEPING DATA ARE CONVERTED INTO A SERIAL PCM BIT STREAM IN A FORMAT COMPATIBLE WITH THE SPACELAB HIGH-RATE MULTIPLEXER.

\*\*\*\*\* SPACELAB 3, HART \*\*\*\*\*

**INVESTIGATION NAME - GEOPHYSICAL FLUID FLOW CELL (GFFC)**

**NSSDC ID - SPALAB3-10** **INVESTIGATIVE PROGRAM**  
**CODE RS**

**INVESTIGATION DISCIPLINE(S)**  
**TECHNOLOGY**

**PERSONNEL**  
 PI - J.E. HART U OF COLORADO

**BRIEF DESCRIPTION**

THE GOAL IS TO PERFORM BASIC EXPERIMENTS RELATIVE TO THE FLUID MECHANICS ASSOCIATED WITH SPHERICAL CONVECTION PROCESSES WITH A VIEW TOWARD CONFIRMING SPECIFIC THEORETICAL PREDICTIONS RELATED TO THE DYNAMICS OF THE SOLAR CONVECTIVE ZONE AND THE JOVIAN ATMOSPHERE. THE EXPERIMENTS ARE BASED ON FLUID DYNAMIC SCALING LAWS THAT PERMIT EXPERIMENTS RELEVANT TO GEOPHYSICAL AND ASTRONOMICAL FLUID DYNAMIC PROCESSES TO BE PERFORMED IN A LABORATORY ENVIRONMENT, SUCH AS THAT OF SPACELAB. THE INSTRUMENT CELL WITHIN WHICH THE FLUID EXPERIMENTS WILL BE PERFORMED CONSISTS OF A ROTATING SPHERICAL CAPACITOR APPROXIMATELY 6 CM IN DIAMETER WITH A 1 CM GAP. THE FLUID IS A DIELECTRIC SUBSTANCE SUCH THAT UPON APPLICATION OF VOLTAGE ACROSS THE GAP AND A RADIALLY DIRECTED TEMPERATURE GRADIENT, A RADIALLY DIRECTED ELECTRIC POLARIZATION FORCE OCCURS IN A MANNER ANALOGOUS TO RADIALLY DIRECTED BUOYANCY FORCES THAT EXIST IN A STAR, A PLANETARY ATMOSPHERE, OR AN OCEAN. IN ADDITION TO RADIAL BUOYANCY FORCES, THE THERMAL FORCING ASSOCIATED WITH POLE TO EQUATOR TEMPERATURE GRADIENTS IS ALSO INCLUDED. THUS, BY PROPER SELECTION OF ROTATION RATES OF THE CAPACITOR, IMPOSED TEMPERATURE GRADIENTS, AND APPLIED VOLTAGES, A ONE-TO-ONE SCALING CAN BE OBTAINED BETWEEN THE EXPERIMENT AND THE SOLAR AND JOVIAN CIRCULATIONS.

\*\*\*\*\* SPACELAB 3, LAL \*\*\*\*\*

**INVESTIGATION NAME - FLUID EXPERIMENT SYSTEMS (FES)**

**NSSDC ID - SPALAB3-01** **INVESTIGATIVE PROGRAM**  
**CODE RS**

**INVESTIGATION DISCIPLINE(S)**  
**TECHNOLOGY**

**PERSONNEL**  
 PI - R.B. LAL ALABAMA A+M U  
 PI - R.L. KROES NASA-MSFC

**BRIEF DESCRIPTION**

THE EXPERIMENT OBJECTIVE IS TO ASSESS THE SCIENTIFIC UNCERTAINTIES REGARDING SOLUTION AND MELT CRYSTAL GROWTH IN A LOW-GRAVITY ENVIRONMENT, OBTAIN BASIC DATA ON CRYSTAL GROWING PROCESSES, AND PRODUCE IMPROVED CRYSTALS BY ELIMINATING CONVECTION TRANSIENTS. THIS EXPERIMENT WILL PRODUCE BASIC DATA ON THE PHYSICAL PROCESSES ASSOCIATED WITH SOLUTION GROWTH OF CRYSTALS. SPECIFIC OBJECTIVES OF THE EXPERIMENT ARE: (A) TO PRODUCE A STRUCTURALLY MORE HOMOGENEOUS CRYSTAL, FREE FROM INCLUSIONS OF SOLUTION, BY ELIMINATING CONVECTION TRANSIENTS, (B) TO OBTAIN DATA ON MASS AND HEAT TRANSPORT IN A LARGELY DIFFUSION-CONTROLLED GROWTH SYSTEM, AND (C) TO CONFIRM THE ADVANTAGES OF A LOW-GRAVITY ENVIRONMENT FOR SOLUTION CRYSTAL GROWTH. THE CRYSTAL GROWTH REGION IN THE FLUID EXPERIMENT SYSTEM IS A LIQUID-FILLED CUBIC VOLUME APPROXIMATELY 10 CM ON A SIDE. THIS VOLUME IS CONTROLLED THERMODYNAMICALLY AND IS OBSERVED VIA A HOLOGRAPHIC OPTICAL SYSTEM. THIS SYSTEM WILL BE USED TO MONITOR THE VARIATIONS IN THE LIQUID DENSITY SOLUTION CONCENTRATION AND TEMPERATURE AROUND GROWING CRYSTALS.

\*\*\*\*\* SPACELAB 3, NONE ASSIGNED \*\*\*\*\*

**INVESTIGATION NAME - RESEARCH ANIMAL HOLDING FACILITY (RAHF)**

**NSSDC ID - SPALAB3-11** **INVESTIGATIVE PROGRAM**  
**CODE SB**

**INVESTIGATION DISCIPLINE(S)**  
**PLANETARY BIOLOGY**

**PERSONNEL**  
 PI - NONE ASSIGNED

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THE RESEARCH ANIMAL HOLDING FACILITY (RAHF) SL 3 VERIFICATION TEST ARE TO EVALUATE OPERATIONAL REQUIREMENTS AND PROCEDURES FOR THE PREFLIGHT PREPARATION, LAUNCH, IN ORBIT, DE-ORBIT, LANDING AND POSTFLIGHT HANDLING AND CARE OF SELECTED ANIMAL SPECIMENS (RAT, MOUSE); TO PROVIDE A FINAL BIOCOMPATIBILITY ASSESSMENT BETWEEN ANIMALS AND THE RAHF UNDER WEIGHTLESS CONDITIONS AND CLOSED LIFE SUPPORT SYSTEMS OF THE SPACE TRANSPORT SYSTEM (STS); TO OBTAIN OPERATIONAL

ORIGINAL PAGE IS  
 OF POOR QUALITY

EXPERIENCE AS A PRECURSOR FOR MORE COMPLEX DEDICATED MISSIONS; AND TO PERFORM A STUDY OF THE PHYSIOLOGICAL, BEHAVIORAL, AND MORPHOLOGICAL CHANGES THAT MAY OCCUR AS A CONSEQUENCE OF CONTAINMENT IN THE RAHF DURING SPACEFLIGHT. 20 RATS AND 24 MICE WILL BE FLOWN IN THE RAHF UNIT. OTHER THAN VISUAL AND PHOTOGRAPHIC OBSERVATION OF THE ANIMALS, NO INTERFACE WITH THE ANIMAL PAYLOAD WILL BE REQUIRED EXCEPT NORMAL HOUSEKEEPING OPERATIONS. RAHF OPERATION AND ANIMAL/RAHF INTERFACES ARE FULLY DOCUMENTED BY VISUAL MEANS, BY TAPED VERBAL COMMENTS, BY WRITTEN NOTES, AND PHOTOGRAPHICALLY USING 16 MM MOTION AND 35 MM STILL CAMERAS. AFTER RECOVERY OF ANIMALS, BEHAVIOR IS MONITORED, AND PHYSIOLOGICAL AND MORPHOLOGICAL DATA ARE OBTAINED TO COMPARE WITH INFLIGHT DATA AND GROUND CONTROLS.

----- SPACELAB 3, NONE ASSIGNED -----

INVESTIGATION NAME- LIFE SCIENCES MINILAB

NSSDC ID- SPALAB3-12

INVESTIGATIVE PROGRAM  
CODE SB

INVESTIGATION DISCIPLINE(S)  
PLANETARY BIOLOGY

PERSONNEL

PI - NONE ASSIGNED

BRIEF DESCRIPTION

THIS EXPERIMENT IS FLOWN TO EVALUATE THE PERFORMANCE OF HUMAN LIFE SCIENCES RESEARCH EQUIPMENT AND FACILITIES IN LOW-GRAVITY AND TO PROVIDE THE CAPABILITY FOR LIMITED HUMAN SCIENTIFIC INVESTIGATIONS WHICH MIGHT OPTIMIZE FUTURE LIFE SCIENCES RESEARCH IN SPACELAB MISSIONS. THE SL 3 JSC LIFE SCIENCES EXPERIMENT CONSISTS OF FOUR AREAS OF LIFE SCIENCES INVESTIGATIONS: FLUID SHIFT MEASUREMENTS, URINE MONITORINGS, INFILTRATION BIOCHEMISTRY, AND PLANT GROWTH. THE HARDWARE ASSOCIATED WITH THESE INVESTIGATIONS HAS THREE MAJOR INTERFACE LOCATIONS THROUGHOUT THE VEHICLE: ORBITER MIDDECK, LIFE SCIENCES MINILAB AND NONMINILAB SPACELAB. THE ORBITER MIDDECK INTERFACES CONSIST OF STORAGE OF SEVERAL HARDWARE ITEMS IN THE MIDDECK LOCKERS AND TEMPORARY MOUNTING OF EQUIPMENT DURING OPERATIONS. THE LIFE SCIENCES MINILAB IS A STANDARD FLIGHT SPACELAB DOUBLE RACK THAT WILL BE INTEGRATED AND CONTAINS BACK MOUNTED AND STORED LIFE SCIENCES HARDWARE. THE SPACELAB NONMINILAB INTERFACES CONSIST OF MOUNTING TO THE SPACELAB DECK A LOWER BODY NEGATIVE PRESSURE DEVICE (LBNP), THE LIFE SCIENCES INVESTIGATIONS ARE AS FOLLOWS: FLUID SHIFT MEASUREMENT EQUIPMENT (FSRE) - THIS INVESTIGATION IS DESIGNED TO EVALUATE A VARIETY OF DEVICES AND TECHNIQUES FOR QUALITATIVELY AND QUANTITATIVELY ASSESSING SHIFTS IN BODY FLUIDS RESULTING FROM EXPOSURE TO THE LOW-GRAVITY ENVIRONMENT OF SPACE. THE DEVICES/TECHNIQUES EVALUATED ARE: CAPACITANCE, IMPEDANCE, AND ULTRASONIC PLETHYSMOGRAPHIC SYSTEMS AND TAPE MEASUREMENT SYSTEMS. PLANT GROWTH FACILITY (PGF) - THIS INVESTIGATION IS DESIGNED TO STUDY THE OPERATION OF GRAVITATIONAL FIELD SENSORS OF PLANTS AND RESPONSE MECHANISM IN A WEIGHTLESS ENVIRONMENT. THE THRESHOLD EXPOSURE TIME FOR A DETECTABLE GRAVITROPIC RESPONSE IS DETERMINED BY VARYING THE DURATION OF EXPOSURE TO SIMULATED GRAVITATIONAL FIELDS WITH THE PLANTS ORIENTED TRANSVERSE TO THE FIELD. DATA ARE ACQUIRED BY AN IR SENSITIVE VIDEO CAMERA OPERATING IN TIME LAPSE MODE AND CAPABLE OF IMAGE RECORDING IN A TIME INTERVAL SHORT ENOUGH TO FREEZE THE PLANT IMAGE AS IT IS ROTATING ON THE CENTRIFUGES. DATA ARE RECORDED ON VIDEO TAPE FOR PROCESSING POSTLANDING. URINE MONITORING SYSTEM (UMS) - THIS INVESTIGATION IS DESIGNED TO EVALUATE THE UMS AND ASSOCIATED HARDWARE TO VERIFY SYSTEM OPERATION IN THE COLLECTION, VOLUME DETERMINATION, AND SAMPLING OF INDIVIDUAL URINE VOIDS OF SPACEFLIGHT CREW MEMBERS. INFILTRATION BIOCHEMISTRY HARDWARE (IBH) - THIS INVESTIGATION IS DESIGNED TO VERIFY THE FLUID DYNAMICS AND BIOCHEMICAL ANALYTICAL CAPABILITY OF THE CENTRIFUGAL FAST ANALYZER (CFA) AND TO PERFORM ANALYSES OF A SELECTED NUMBER OF METABOLITES IN URINE, PLASMA, AND WHOLE BLOOD.

----- SPACELAB 3, RUSSELL, 3RD -----

INVESTIGATION NAME- HALOGEN OCCULTATION EXPERIMENT (HALOE)

NSSDC ID- SPALAB3-13

INVESTIGATIVE PROGRAM  
CODE ST

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - J.M. RUSSELL, 3RD

NASA-LARC

BRIEF DESCRIPTION

THE PRIMARY PURPOSE OF THE HALOE SL 3 EXPERIMENT IS TO VALIDATE THE INSTRUMENT DESIGN WITH ASSOCIATED CALIBRATION TECHNIQUES AND DATA REDUCTION SOFTWARE. A SECONDARY PURPOSE IS TO COLLECT A LIMITED QUANTITY OF MEASUREMENTS ON GAS CONCENTRATION VERSUS ALTITUDE FOR GAS SPECIES (HF, HCl, CO<sub>2</sub>, CH<sub>4</sub>, NO, H<sub>2</sub>O, AND O<sub>3</sub>) USING INFRARED REMOTE SENSING TECHNIQUES DURING SOLAR OCCULTATION EVENTS. THE HALOE INSTRUMENT IS AN INFRARED SENSOR THAT MEASURES TRACE GASES IN THE EARTH'S ATMOSPHERE TO ENHANCE OUR UNDERSTANDING OF CHEMICAL REACTION CHAINS AFFECTING THE OZONE LAYER. HF, HCl, NO, AND CH<sub>4</sub> ARE MEASURED USING THE PRINCIPLE OF GAS CORRELATION SPECTROSCOPY. CO<sub>2</sub>, H<sub>2</sub>O, AND O<sub>3</sub> ARE MEASURED BY BROADBAND RADIOMETRY TECHNIQUES. THE EIGHT SENSING CHANNELS ARE LOCATED IN SPECTRAL REGIONS BETWEEN 2 AND 11 MICROMETERS. THE INSTRUMENT IS DESIGNED TO OPERATE FROM AN ORBITING SPACECRAFT USING SOLAR

ENERGY PASSING THROUGH THE EARTH'S ATMOSPHERE AS THE RADIOMETRIC INPUT. MEASUREMENT OF THE VARIOUS GAS SPECIES IS BASED UPON DETECTION OF SPECTRAL ABSORPTION CHARACTERISTICS. THE INSTRUMENT CONSISTS OF AN OPTICS HEAD, SUPPORTED BY A TWO-AXIS AZIMUTH OVER ELEVATION GIMBAL, AND A SEPARATE ELECTRONICS PACKAGE. IT CONTAINS SENSORS AND CONTROLS TO ACQUIRE AND TRACK THE SUN AT TIMES OF MEASUREMENT. MEASUREMENTS ARE PERFORMED AT SUNRISE AND SUNSET EVENT TIMES, WHEN THE SOLAR LINE OF SIGHT PASSES THROUGH THE EARTH'S ATMOSPHERE. HALOE RECEIVES COMMANDS, SYNCHRONIZED PULSES, AND DC POWER FROM THE SPACECRAFT. OUTPUT DATA IN SERIAL DIGITAL FORM ARE PRESENTED TO THE SPACECRAFT FOR STORAGE AND TRANSMISSION TO THE GROUND.

----- SPACELAB 3, SCHNEPPLE -----

INVESTIGATION NAME- VAPOR CRYSTAL GROWTH SYSTEM (VCGS)

NSSDC ID- SPALAB3-02

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - W.F. SCHNEPPLE

EG&G INC

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO GROW LARGE SINGLE CRYSTALS OF MERCURIC ICIDE (HG12) THAT ARE RELATIVELY FREE OF MASS LOAD STRAIN DEFECTS AND PHYSICAL PROPERTY INHOMOGENEITIES. THIS EXPERIMENT WILL PRODUCE A SINGLE CRYSTAL OF HG12 VIA THE SUBLIMATION CRYSTAL GROWTH PROCESS IN AN APPROXIMATELY 10 CM DIAMETER BY 15 CM HIGH EVACUATED AMPOULE. THE HG12 SOURCE MATERIAL ON THE WALLS OF THE AMPOULE IS HEATED SUCH THAT HG12 MOLECULES ARE EVAPORATED. A PLATE AT THE BOTTOM OF THE AMPOULE WITH A HG12 SEED CRYSTAL IS HELD AT A TEMPERATURE BELOW THE SOURCE MATERIAL TEMPERATURE. THE RESULTING TEMPERATURE GRADIENT BETWEEN THE AMPOULE WALLS AND THE SEED CRYSTAL WILL CAUSE HG12 MOLECULES TO BE TRANSPORTED TO THE SEED CRYSTAL, WHEREUPON THE MOLECULES WILL CONDENSE INTO THE SOLID PHASE. OBSERVATIONS OF THE CRYSTAL GROWING PROCESS WILL BE MADE VIA A MICROSCOPE. IF OUT-OF-CONTROL GROWTH CONDITIONS OCCUR, THE CRYSTAL TEMPERATURE WILL BE RAISED ABOVE THE SOURCE MATERIAL TEMPERATURE TO REMOVE THE ASSOCIATED UNWANTED CRYSTAL MASS, WITH SUBSEQUENT CRYSTAL COOL-DOWN TO CONTINUE THE GROWTH PROCESS.

----- SPACELAB 3, WANG -----

INVESTIGATION NAME- DROP DYNAMICS MODULE (DDM) EXPERIMENTS

NSSDC ID- SPALAB3-09

INVESTIGATIVE PROGRAM  
CODE RS

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL

PI - T.G. WANG

NASA-JPL

BRIEF DESCRIPTION

THE EXPERIMENT OBJECTIVE IS TO PERFORM BASIC EXPERIMENTS ON THE DYNAMICS OF ROTATING AND OSCILLATING DROPS, WITH A VIEW TOWARD CONFIRMING SPECIFIC THEORETICAL PREDICTIONS AND GAINING INSIGHT AND DIRECTION RELATIVE TO THOSE DYNAMICAL PROCESSES NOT CURRENTLY ACCESSIBLE BY THEORY. THE DROP DYNAMICS EXPERIMENTS WILL BE CONDUCTED IN AN ACOUSTICAL CHAMBER. THE LIQUID INJECTOR WILL INJECT A LIQUID BETWEEN TWO PROBES THAT WILL RETRACT WHEN A PREDETERMINED SIZE DROP IS FORMED, CAUSING THE DROP TO BE FREE FLOATING INSIDE THE ACOUSTIC CHAMBER. THREE ACOUSTIC SOURCES WILL GENERATE AN AUDIBLE TONE THAT IS VARIED IN FREQUENCY AND AMPLITUDE TO ROTATE AND OSCILLATE THE LIQUID DROP. A MOVIE CAMERA WILL BE USED WITH PRISMS AND MIRROR SURFACES TO RECORD THE MOVING DROPS FROM THREE DIFFERENT ANGLES. ALSO, THE VARIOUS PARAMETERS THAT WILL BE VARIED, SUCH AS THE FREQUENCY, AMPLITUDE, VOLTAGE, ETC., WILL BE RECORDED ON FILM. IN CONJUNCTION WITH THE CAMERA RECORDING, A REDUNDANT RECORDING WILL BE MADE ON A MAGNETIC CARTRIDGE IN THE EVENT THE CAMERA IS NOT WORKING OR RUNS OUT OF FILM. THE INSTRUMENT IS DESIGNED TO RUN BOTH AUTOMATICALLY BY PREPROGRAMMED MICROPROCESSORS THROUGH THE CONTROL PANEL AND MANUALLY BY CONTROLS ON THE CONTROL PANEL IF PARAMETERS DIFFERENT FROM THE ONES WHICH ARE IN THE SOFTWARE PROGRAM NEED TO BE INSERTED. THESE EXPERIMENTS ARE AIMED AT EXPERIMENTAL CONFIRMATION OF THEORETICAL PREDICTIONS OF FREE OSCILLATING AND ROTATING DROPS WITH DIAMETER OF ABOUT 1 CM.

\*\*\*\*\* ST \*\*\*\*\*

SPACECRAFT COMMON NAME- ST

ALTERNATE NAMES- LARGE SPACE TELESCOPE, SPACE TELESCOPE

NSSDC ID- LST

LAUNCH DATE- 12/15/83

LAUNCH SITE- CAPE CANAVERAL, UNITED STATES

LAUNCH VEHICLE- SHUTTLE

WEIGHT- 9100. KG

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-DSS

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 94.5 MIN  
PERIAPSIS- 500. KM ALT  
INCLINATION- 28.0 DEG  
APOAPSIS- 500. KM ALT

PERSONNEL  
MG - D.R. BURROWBRIDGE NASA HEADQUARTERS  
SC - N.G. RONAN NASA HEADQUARTERS  
PM - W.C. KEATHLEY NASA-GSFC  
PN - G.M. LEVIN NASA-GSFC  
PS - C.R. O'DELL NASA-GSFC

BRIEF DESCRIPTION  
THE SPACE TELESCOPE (ST) IS A SPACEBORNE, DIFFRACTION-LIMITED RITCHIE-CHRETIEN TELESCOPE WITH THE FOLLOWING PARAMETERS: AN EFFECTIVE APERTURE OF 2.4 M, A SPATIAL RESOLUTION OF 0.1 ARC S, AND A WAVELENGTH COVERAGE FROM 0.1 TO 1000 MICROMETERS. THE EXPECTED LIMITING MAGNITUDE IS BETWEEN 27 AND 28. THIS IS 10 TIMES BETTER RESOLUTION AND GREATER WAVELENGTH COVERAGE THAN GROUND-BASED TELESCOPES, AND DETECTS OBJECTS THAT ARE 50 TIMES FAINTER. THE TELESCOPE IS CAPABLE OF ACCOMMODATING FIVE DIFFERENT INSTRUMENTS AT ITS FOCAL PLANE. THE SPACE SHUTTLE IS USED FOR INITIAL LAUNCH, IN-ORBIT SERVICING, AND FOR RETURN OF THE ST TO THE GROUND FOR MAINTENANCE. THE ANTICIPATED MINIMUM OPERATIONAL LIFETIME, EXCLUDING DOWNTIME FOR PERIODIC MAINTENANCE AND UPDATING, IS GREATER THAN 15 YR. THE ST SYSTEM SERVES AS A NATIONAL ASTRONOMICAL SPACE OBSERVATORY FACILITY. THE USE OF THE ONBOARD INSTRUMENTATION IS OPEN TO SCIENTISTS OF ALL COUNTRIES. ITS DESIGN IS FLEXIBLE TO ALLOW FOR THE REPLACEMENT OF SCIENTIFIC INSTRUMENTATION WHEN NECESSARY, TO INCORPORATE TECHNOLOGICAL ADVANCES, AND TO SATISFY CHANGES IN THE OBSERVATIONAL INTERESTS OF THE ASTRONOMICAL COMMUNITY. INSTRUMENTATION UPDATING, REPAIR, OR REPLACEMENT CAN BE ACCOMPLISHED EITHER BY RETURN OF THE ST TO THE GROUND, OR BY USING SUITED ASTRONAUTS FOR IN-ORBIT WORK.

----- ST, HARMS-----

INVESTIGATION NAME- HIGH-SPEED PHOTOMETER (HSP)

NSSDC ID- LST -06 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL  
PI - R.C. BLESS U OF WISCONSIN  
OI - G.W. VAN CITTERS U OF TEXAS, AUSTIN  
OI - E.L. ROBINSON U OF TEXAS, AUSTIN  
OI - J.L. ELLIOT CORNELL U  
OI - A.D. CODE U OF WISCONSIN

BRIEF DESCRIPTION

THE HIGH-SPEED PHOTOMETER (HSP) INVESTIGATION MAKES FAST-TIME-RESOLUTION (1 MS AND SLOWER) PHOTOMETRIC OBSERVATIONS OF RAPIDLY VARYING OBJECTS IN THE SPECTRAL RANGE 115-850 NM AND LINEAR POLARIMETRIC OBSERVATIONS FROM 210 TO 700 NM OF A WIDE VARIETY OF OBJECTS. IT ESTABLISHES AN ACCURATE LINK BETWEEN OBSERVATIONS MADE ON EXISTING VISUAL AND UV PHOTOMETRIC SYSTEMS AND THE CORRESPONDING OBSERVATIONS OF THE FAINT OBJECTS OBSERVED BY THE SPACE TELESCOPE. THE INSTRUMENT CONSISTS OF TWO IMAGE DISSECTORS - ONE SENSITIVE IN THE UV AND SOLAR BLIND, THE OTHER SENSITIVE IN THE VISUAL AND NEAR INFRARED. A WIDE VARIETY OF BANDPASSES IS FORMED BY BROADBAND AND INTERFERENCE FILTERS ARRANGED IN STRIPS ACROSS THE DISSECTOR TUBE'S PHOTOCATHODE. SOME OF THE FILTERS ARE COATED WITH A POLARIZING MATERIAL. DIAPHRAGMS PROVIDE A CHOICE OF THREE FIELDS OF VIEW: 0.7, 1.4, AND 2.8 ARC S. THE DISSECTORS CAN BE COMMANDED TO RECEIVE PHOTOELECTRONS FROM ANY OF THE APPROXIMATELY 100 FILTER-DIAPHRAGM-POLARIZER COMBINATIONS AVAILABLE. THE TWO DETECTORS CAN BE LOCATED INSIDE OR OUTSIDE OF AN AXIAL INSTRUMENT BAY, WITH NO ADDITIONAL OPTICS REQUIRED.

----- ST, BRANDT-----

INVESTIGATION NAME- HIGH-RESOLUTION SPECTROGRAPH (HRS)

NSSDC ID- LST -02 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL  
PI - J.C. BRANDT NASA-GSFC  
OI - A. BOGESS, 3RD NASA-GSFC  
OI - E.A. BEAVER U OF CALIF, SAN DIEGO  
OI - S.R. HEAP NASA-GSFC  
OI - J.R. HUTCHINGS DOMINION ASTROPHYS OBS  
OI - M.A. JURA U OF CALIF, LA  
OI - J.L. LINSKY U OF COLORADO  
OI - S.P. MARAN NASA-GSFC  
OI - B.D. SAVAGE U OF WISCONSIN  
OI - A.M. SMITH NASA-GSFC  
OI - L.M. TRAFTON U OF TEXAS, AUSTIN  
OI - R.J. WEYHANN U OF ARIZONA

BRIEF DESCRIPTION

THIS INVESTIGATION USES AN ULTRAVIOLET SPECTROGRAPH CAPABLE OF OBTAINING HIGH-QUALITY SPECTRA AT TWO RESOLVING POWERS: 20,000 AND 120,000. THE LOWER DISPERSION IS ACHIEVED WITH FOUR GRATINGS THAT COVER THE SPECTRAL RANGE 110-320 NM SO THAT EACH GRATING IS USED ONLY NEAR ITS MAXIMUM BLAZE EFFICIENCY. THE HIGHER DISPERSION UTILIZES AN ECHELLE ARRANGEMENT. THE SENSOR IS A MULTI-CHANNEL PULSE-COUNTING DEVICE, THE PIGICON. THIS DETECTOR OPERATES FUNCTIONALLY LIKE AN IMAGE-DISSECTOR TUBE AND CAN BE USED AS AN IMAGE DISSECTOR TO PERFORM STAR CENTERING AND FIELD MAPPING OF THE ENTRANCE APERTURE, ELIMINATING THE NEED FOR A SEPARATE STAR TRACKER OR SLIT CAMERA. THERE ARE TWO DETECTORS, ONE WITH A CSTE PHOTOCATHODE AND ONE WITH CSI. THE TWO TARGET ENTRANCE APERTURES HAVE FIELDS OF VIEW OF 1.50 ARC S AND 0.350 ARC S, RESPECTIVELY. THERE ARE NO SIGNIFICANT TIME CONSTRAINTS. THE HIGH RESOLUTION SPECTROGRAPH (HRS) OPERATES IN SUNLIGHT SO THAT IT CAN BE UTILIZED AT ALL TIMES, EXCEPT WHEN THE SOURCE IS OCCULTED BY THE EARTH OR MOON. THE HIGH DYNAMIC RANGE AND CHOICE OF DISPERSIONS MAKE IT POSSIBLE TO OBSERVE A LARGE RANGE OF STELLAR MAGNITUDES, FROM VERY BRIGHT TO MODERATELY FAINT. THE HRS BRIDGES THE GAP BETWEEN OBJECTS OBSERVED BY ROCKET-BORNE SPECTROGRAPHS, COPERNICUS, IUE, AND THE FAINT-OBJECT SPECTROGRAPH (FOS).

----- ST, HARMS-----

INVESTIGATION NAME- FAINT-OBJECT SPECTROGRAPH (FOS)

NSSDC ID- LST -03 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - R.J. HARMS	U OF CALIF, SAN DIEGO
OI - F. BARTKO, JR.	MARTIN-MARIETTA AEROSP
OI - F.A. BEAVER	U OF CALIF, SAN DIEGO
OI - H.C. FORD	U OF CALIF, LA
OI - B. MARGON	U OF CALIF, LA
OI - A.F. DAVIDSEN	JOHNS HOPKINS U
OI - E.M. BURBIDGE	U OF CALIF, SAN DIEGO
OI - J.R. ANGEL	U OF ARIZONA

BRIEF DESCRIPTION

THE FAINT-OBJECT SPECTROGRAPH (FOS) INVESTIGATION OBTAINS SPECTRA OF ASTRONOMICAL OBJECTS AT THE FAIREST POSSIBLE LIMITING MAGNITUDE IN ULTRAVIOLET AND VISIBLE WAVELENGTHS. THE SPECTROGRAPH COVERS A BROAD SPECTRAL RANGE AND IS INTENDED FOR SPECTROSCOPY PRIMARILY AT MODEST SPECTRAL RESOLUTION. THE SPECTRAL PROFILES OF BROAD EMISSION AND ABSORPTION FEATURES AND CONTINUUM FLUX DISTRIBUTIONS ARE OBSERVED IN BOTH EXTENDED AND POINT SOURCES. THE FOS DESIGN IS BASED ON A FIXED-SLOT SPECTROGRAPH WITH THE CAPABILITY OF SELECTING EITHER OF TWO SPECTRAL RESOLVING POWERS (100 OR 1000) OVER THE WAVELENGTH RANGE 114-1000 NM. A NONDISPERSIVE MODE IS ALSO AVAILABLE, PROVIDING CAMERA IMAGES FOR SCIENTIFIC AND TARGET ACQUISITION PURPOSES. A POLARIZATION-ANALYZER CAPABILITY IS PROVIDED OVER THE WAVELENGTH RANGE 180-285 NM. THE FOS USES A 512-DIODE LINEAR ARRAY OF PHOTON-COUNTING DIGITONS AS DETECTORS. TO COVER THE FULL WAVELENGTH RANGE, TWO DETECTORS ARE USED. THE ULTRAVIOLET/VISIBLE SENSOR HAS A MAGNESIUM FLUORIDE FACEPLATE AND A BIALKALI PHOTOCATHODE. THE VISIBLE/NEAR-IR SENSOR HAS THE SAME WINDOW MATERIAL AND AN EXTENDED-RED TRIALKALI PHOTOCATHODE. FOR THE FAIREST OBJECTS, INTEGRATION TIMES ARE LONG.

----- ST, JEFFERYS-----

INVESTIGATION NAME- ASTROMETRY SCIENCE

NSSDC ID- LST -09 INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - M.H. JEFFERYS	U OF TEXAS, AUSTIN
OI - G.F. BENEDICT	U OF TEXAS, AUSTIN
OI - P.D. HEMENWAY	U OF TEXAS, AUSTIN
OI - P.J. SHELLUS	U OF TEXAS, AUSTIN
OI - R.L. DUNCOMBE	U OF TEXAS, AUSTIN
OI - W.F. VAN ALTEA	YALE U
OI - O.G. FRANZ	LORILL OBSERVATORY
CI - L.W. FREDERICK	U OF VIRGINIA

BRIEF DESCRIPTION

THIS INVESTIGATION USES THE FACILITIES OF THE OPTICAL TELESCOPE ASSEMBLY, INSTEAD OF REQUIRING A SEPARATE INSTRUMENT. THE SPACE TELESCOPE (ST) FINE GUIDANCE SYSTEM (FGS) CONSISTS OF THREE IDENTICAL SENSORS DISTRIBUTED IN AN ANNULUS CENTERED ON THE OPTICAL AXIS OF THE ST. EACH SENSOR HAS ITS OWN FIELD OF VIEW (FOV). IN NORMAL OPERATIONS, TWO OF THE SENSORS ARE USED FOR FINE POINTING THE ST. THE SENSOR THAT IS NOT USED FOR TELESCOPE POINTING IS THE PRIMARY ASTROMETRIC INSTRUMENT AT THAT PARTICULAR TIME. AN FGS SENSOR CONSISTS OF A SET OF GIMBALED MIRRORS SUCH THAT ANY STAR WITHIN ITS FOV CAN BE PLACED ON AN IMAGE DISSECTOR/INTERFEROMETER COMBINATION. THE ENCODER READINGS OF THE GIMBALED MIRROR AXES SUPPLY THE OBJECT POSITION IN THE FOV; THE OUTPUT OF EACH OF THE PAIR OF INTERFEROMETERS SUPPLIES A FINE ERROR SIGNAL. EACH SENSOR CONTAINS A SET OF MOVEABLE FILTERS, AND TEMPERATURE, VOLTAGE,

AND OTHER MONITORS. THE ASTROMETRY EXPERIMENTER OBSERVES STARS IN AN APPROXIMATE MAGNITUDE RANGE OF 3-20. THE EXPERIMENT HAS THE CAPABILITY OF OBSERVING 10 OBJECTS OF THE 17TH MAGNITUDE IN 10 MIN.

----- ST. VAN DE HULST -----

INVESTIGATION NAME- FAINT-OBJECT CAMERA (FOC)

NSSDC ID- LST -08

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - W.C. VAN DE HULST	HUYGENS LAB
OI - I.R. KING	U OF CALIF, BERKELEY
OI - P. CRANE	EUROPE SO OBS, SWIZZ
OI - R. ALBRECHT	U OF VIENNA
OI - C. BARBIERI	U OF PADOVA
OI - A. BOSENBERG	U COLLEGE LONDON
OI - M.J. DISNEY	U COLLEGE CARDIFF
OI - T.M. KAMPERMAN	ASTRONOMICAL INST
OI - C.B. MACKAY	U OF CAMBRIDGE
OI - R.N. WILSON	EUROPE SO OBS, SWIZZ
OI - J.W. DEHARVENG	CNR-LAS

BRIEF DESCRIPTION

THE FAINT-OBJECT CAMERA (FOC) INVESTIGATION USES AN IMAGING CAMERA WITH A TWO-DIMENSIONAL PHOTON-EVENT COUNTING DETECTOR, OPERATING AT A HIGH FOCAL RATIO, WHICH FULLY EXPLOITS THE SPATIAL RESOLVING POWER OF THE ST, AND IS ABLE TO DETECT OBJECTS THAT ARE 50 TIMES FAIWER THAN THOSE OBSERVABLE WITH THE MOST POWERFUL EARTHBOUND TELESCOPE. THE FOC HAS A MINIMUM FORMAT OF 200 X 200 PIXELS. BASED ON A PIXEL SIZE OF 25 X 25 MICROMETERS, A FOCAL RATIO OF APPROXIMATELY F/96 IS REQUIRED TO EXPLOIT THE SPATIAL RESOLVING POWER OF THE ST. AT THAT FOCAL RATIO, THE PIXEL SIZE IS 0.022 X 0.022 SQ ARC S AND THE FIELD OF VIEW OF A 200 X 200 PIXEL CAMERA IS 4.4 X 4.4 SQ ARC S. FOR IMAGERY AND PHOTOMETRY OF VERY FAINT STARS AND EXTENDED SOURCES, CUMULATIVE EXPOSURES ARE REQUIRED TO OBTAIN A USEFUL SIGNAL-TO-NOISE RATIO. THE WAVELENGTH RANGE IS 120 TO 800 NM AND THE DYNAMIC RANGE IS FROM 21ST TO 28TH VISUAL MAGNITUDE FOR POINT SOURCES, AND FROM 19TH TO 22ND VISUAL MAGNITUDE/SQ ARC S FOR EXTENDED SOURCES.

----- ST. WESTPHAL -----

INVESTIGATION NAME- WIDE-FIELD CAMERA (WFC)

NSSDC ID- LST -07

INVESTIGATIVE PROGRAM  
CODE SC/CO-OP

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL

PI - J.A. WESTPHAL	CALIF INST OF TECH
OI - W.A. BAUM	LOWELL OBSERVATORY
OI - D.G. CURRIE	U OF MARYLAND
OI - G.E. DANIELSON	CALIF INST OF TECH
OI - B.A. SMITH	U OF ARIZONA
OI - A.D. COPE	U OF WISCONSIN
OI - J.E. GUNN	CALIF INST OF TECH
OI - J. KRISTIAN	CALIF INST OF TECH
OI - C.R. LYNDS	KITT PEAK NATL OBS
OI - P.K. SEIDELMANN	US NAVAL OBSERVATORY

BRIEF DESCRIPTION

THE WIDE-FIELD CAMERA INVESTIGATION USES TWO CAMERAS OF DIFFERENT FOCAL LENGTHS HOUSED IN A SINGLE PLANETARY RADIAL RAY. ONE IS A WIDE-FIELD CAMERA AND THE OTHER IS A PLANETARY CAMERA. EACH CAMERA USES A SIMPLE OPTICAL MOSAIC TECHNIQUE IN CONJUNCTION WITH FOUR CHARGE-COUPLED DEVICES (CCD) AS DETECTORS, EACH HAVING 800 X 800 PICTURE ELEMENTS. EACH CCD IS THINNED FOR BACK-SIDE ILLUMINATION, AND THEIR SPECTRAL RESPONSES ARE EXTENDED SHORTWARD FROM THE VISIBLE TO THE VACUUM ULTRAVIOLET BY SPECIAL PROCESSING. THE OVERALL QUANTUM EFFICIENCY OF THE INSTRUMENT IS ABOUT 10 PERCENT FROM LYMAN ALPHA (121.6 NM) TO 350 NM, RISING RAPIDLY TO ABOUT 50 PERCENT FROM 450 TO 800 NM, THEN GRADUALLY DECREASING INTO THE INFRARED. THE COMBINATION OF THE OPTICAL MOSAIC AND CCD DETECTORS PROVIDES A CONTIGUOUS FIELD WITH AN OVERALL SIZE OF 1600 X 1600 PIXELS. FOCAL RATIOS OF F/12.9 AND F/30 GIVE FIELD SIZES OF 2.67 SQ ARC MIN AT A RESOLUTION OF 0.1 ARC S PER PIXEL FOR THE WIDE-FIELD CAMERA AND 68.7 SQ ARC S AT 0.043 ARC S PER PIXEL FOR THE PLANETARY CAMERA. THE INSTRUMENT CONTAINS SPACE FOR 50 FILTERS, POLARIZERS/FILTERS, AND TRANSMISSION GRATINGS.

\*\*\*\*\* STP P80-1\*\*\*\*\*

SPACECRAFT COMMON NAME- STP P80-1

ALTERNATE NAMES- SPACE TEST PROGRAM P80-1, P80-1

NSSDC ID- P80-1

LAUNCH DATE- 5 OCT 81 WEIGHT- KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 99.6 MIN INCLINATION- 72.5 DEG  
PERIAPSIS- 740.8 KM ALT APOAPSIS- 740.8 KM ALT

PERSONNEL  
PM - J.N. JENSEN USAF SPACE DIVISION  
PS - J.R. STEVENS AEROSPACE CORP

BRIEF DESCRIPTION  
SPACE TEST PROGRAM P80-1 IS A DOD SATELLITE WHICH IS ESSENTIALLY A RECTANGULAR PARALLELEPIPED OF APPROXIMATE DIMENSIONS 2.4 X 2.4 X 0.7 METERS. IT HAS A CIRCULAR ORBIT AND IS THREE-AXIS STABILIZED TO MAINTAIN ONE 2.4 X 2.4 METER SURFACE VECTOR NADIR POINTING. THE SPACECRAFT SERVES AS A STABLE PLATFORM REFERENCE FOR THREE EXPERIMENT TELESCOPES. TELEMETRY CAPABILITY IS PCM AND USES ON-GUARD STORAGE TAPE RECORDERS WITH UP TO 6 HOURS STORAGE.

----- STP P80-1, BOWYER -----

INVESTIGATION NAME- EXTREME ULTRAVIOLET PHOTOMETER

NSSDC ID- P80-1 -03 INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
EARTH RESOURCES SURVEY  
ASTRONOMY

PERSONNEL  
PI - C.S. BOWYER U OF CALIF, BERKELEY  
OI - D. FINLEY U OF CALIF, BERKELEY

BRIEF DESCRIPTION  
THE EXTREME-ULTRAVIOLET PHOTOMETER INVESTIGATION CONSISTS OF TWO IMAGING GRAZING-INCIDENCE TELESCOPES WITH SEVERAL BROADBAND FILTERS SENSITIVE TO EXTREME AND FAR ULTRAVIOLET RADIATION. ONE TELESCOPE IS NADIR-LOOKING AND THE OTHER IS ZENITH-LOOKING. THE ORBITAL MOTION OF THE SPACECRAFT PROVIDES A SCANNING FUNCTION, RESULTING IN A MAPPING OF EARTH AND SKY IN THE WAVELENGTH REGIONS OF INTEREST THROUGHOUT THE MISSION.

----- STP P80-1, LARSON -----

INVESTIGATION NAME- TEAL RUBY

NSSDC ID- P80-1 -01 INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
EARTH RESOURCES SURVEY

PERSONNEL  
PI - J.C. LARSON LOCKHEED PALO ALTO

BRIEF DESCRIPTION  
THIS INVESTIGATION USES AN INFRARED TELESCOPE AND DETECTION SYSTEM WHICH HAS A MULTISPECTRAL MOSAIC FOCAL PLANE TO MEASURE SIGNAL STRENGTH IN A VARIETY OF SPECTRAL BANDS IN THE INFRARED. IT GATHERS EARTH BACKGROUND DATA AND TESTS TECHNIQUES FOR IR DETECTION AND DATA REDUCTION.

----- STP P80-1, POWER -----

INVESTIGATION NAME- ION AUXILIARY PROPULSION SYSTEM

NSSDC ID- P80-1 -02 INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
TECHNOLOGY

PERSONNEL  
PI - J.L. POWER NASA-LERC

BRIEF DESCRIPTION  
THE ION AUXILIARY PROPULSION SYSTEM WILL TEST TWO MERCURY ION THRUSTERS, EACH PRODUCING ONE MILLIPOUND OF THRUST. THESE ARE CONFIGURED ON THE SPACECRAFT TO BE REPRESENTATIVE OF THRUSTER'S USE FOR STATIONKEEPING AND MANEUVERING. INSTRUMENTATION PROVIDES THRUSTER PERFORMANCE AND MEASURES THE EFFECTS OF THE THRUSTERS ON OTHER SPACECRAFT COMPONENTS AND FUNCTIONS.

\*\*\*\*\* STP P80-2\*\*\*\*\*

SPACECRAFT COMMON NAME- STP P80-2

ALTERNATE NAMES- SPACE TEST PROGRAM P80-2, P80-2

SIRE

NSSDC ID- P80-2

LAUNCH DATE- 1 OCT 81  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY  
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 97. MIN  
PERIAPSIS- 740. KM ALT  
INCLINATION- 98.3 DEG  
APOAPSIS- 740. KM ALT

PERSONNEL  
PM - W.J. MIERMANN USAF SPACE DIVISION  
PS - J.R. STEVENS AEROSPACE CORP

BRIEF DESCRIPTION  
THE SPACE TEST PROGRAM P80-2 SPACECRAFT IS AN ASCENT AGENA (SIMILAR TO SEASAT) WHICH IS MODIFIED TO CARRY ORBITAL EXPERIMENTS ON THE FORWARD STRUCTURE. HIGH ELECTRIC POWER REQUIREMENTS ARE MET BY FLEXIBLE ROLL OUT SOLAR ARRAY PANELS WHICH EXTEND FROM THE AGENA. THE TWILIGHT SUN-SYNCHRONOUS ORBIT ALLOWS DEPLOYMENT OF THE ARRAY PERPENDICULAR TO THE INSOLATION VECTOR. EXPERIMENT DATA MAY BE READ OUT BY GROUND STATIONS OR MAY BE RECORDED FOR SUBSEQUENT TRANSMISSION TO THE GROUND STATIONS. THE INVESTIGATIONS WILL TEST A DEEP SPACE VIEWING INFRARED TELESCOPE WITH ACTIVE CRYOGENIC REFRIGERATION, AND MEASURE SOLAR FLARE ISOTOPIC COMPOSITION.

----- STP P80-2, LYONS-----

INVESTIGATION NAME- SATELLITE INFRARED (SIRE)

NSSDC ID- P80-2 -01 INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)  
ASTRONOMY

PERSONNEL  
PI - J. LYONS USAF SPACE DIVISION

BRIEF DESCRIPTION  
THIS INVESTIGATION EMPLOYS AN ACTIVELY CRYO-COOLED TELESCOPE FOCAL PLANE WITH MULTIPLE FILTER BANDS FOR OBSERVATION OF STAR AND GALACTIC RADIANCE PROFILES AND AURORAS. THE TELESCOPE IS GIMBALED FOR 1-DEGREE OF FREEDOM SCANS, RELYING ON SPACECRAFT MANEUVERS AND OPTICAL FOV FOR ADDITIONAL OBSERVATIONAL SCOPE. THE REFRIGERATOR IS AN ELECTRICALLY POWERED VUILLUMIER CYCLE MACHINE OF THE TYPE FLOWN ON PREVIOUS STP FLIGHTS.

----- STP P80-2, SIMPSON-----

INVESTIGATION NAME- COSMIC RAY ISOTOPE (CRIE)

NSSDC ID- P80-2 -02 INVESTIGATIVE PROGRAM  
SPACE TEST PROGRAM/CODE ST

INVESTIGATION DISCIPLINE(S)  
SOLAR PHYSICS  
PARTICLES AND FIELDS

PERSONNEL  
PI - J.A. SIMPSON U OF CHICAGO  
OI - M. GARCIA-MUNOZ U OF CHICAGO  
OI - J.P. WEFEL U OF CHICAGO

BRIEF DESCRIPTION  
THE PRIMARY OBJECTIVES OF THIS INVESTIGATION ARE TO: (1) STUDY SOLAR FLARE ENERGY CONVERSION AND SOLAR ACCELERATION MECHANISMS, AND (2) TO MONITOR SOLAR FLARE PARTICLE FLUXES. OBJECTIVE (1) IS DONE THROUGH THE IDENTIFICATION OF ISOTOPES WHOSE PRESENCE IS A MEASURE OF THE AMOUNT OF SOLAR MATTER TRAVELED DURING ACCELERATION AND THE TIME SPENT WITHIN THE SOLAR CORONA. THE INSTRUMENT PACKAGE CONTAINS THREE MULTI-ELEMENT SOLID-STATE DETECTOR TELESCOPES. THE HIGH-ENERGY TELESCOPE IS USED TO RESOLVE ISOTOPES FROM HYDROGEN TO NICKEL IN THE ENERGY RANGE 20 TO 500 MEV/NUCLEON, AND ITS VIEW ANGLE IS 93 DEG (FULL CONE). THE LOW-ENERGY TELESCOPE IS USED TO RESOLVE ISOTOPES FROM HELIUM TO NICKEL IN THE RANGE 4 TO 230 MEV/NUCLEON, AND ITS VIEW ANGLE IS 80 DEG. THE MONITOR TELESCOPE DETECTS PROTONS FROM 0.5 TO 3.2 MEV AND HELIUM FROM 0.7 TO 2.5 MEV/NUCLEON. ITS VIEW ANGLE IS 75. DEG. DATA RATES ARE ONE 360-BIT WORD/S FOR THE HIGH-ENERGY TELESCOPE AND ONE 360-BIT WORD/S FOR THE LOW-ENERGY AND MONITOR TELESCOPES COMBINED.

\*\*\*\*\* UARS-1 \*\*\*\*\*

SPACECRAFT COMMON NAME- UARS-1  
ALTERNATE NAMES- UPPER ATMOSPHERESAT

NSSDC ID- UARS-1

LAUNCH DATE- 10/00/86 WEIGHT- 3225. KG  
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES

NASA-DA

PLANNED ORBIT PARAMETERS  
ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 97. MIN  
PERIAPSIS- 600. KM ALT

INCLINATION- 56. DEG  
APOAPSIS- 600. KM ALT

PERSONNEL

MG - R.J. ARNOLD  
SC - R.K. SEALS  
PR - P.T. BURR  
PS - C.A. REBER

NASA HEADQUARTERS  
NASA HEADQUARTERS  
NASA-GSFC  
NASA-GSFC

BRIEF DESCRIPTION

TWO UPPER ATMOSPHERE RESEARCH SATELLITES, UARS-1 AND UARS-2, ARE PART OF THE UPPER ATMOSPHERE RESEARCH PROGRAM. THE BASIC OBJECTIVES OF THE UARS-1 MISSION ARE TO CONDUCT RESEARCH IN THE ATMOSPHERE ABOVE THE TROPOPAUSE, AND TO MEASURE THE GLOBAL BUDGET OF CONSTITUENT TRACE GASES AND THEIR CHEMICAL, DYNAMICAL, AND RADIATIVE BEHAVIOR. SPECIFICALLY THE OBJECTIVES ARE: (1) TO STUDY ENERGY INPUT AND LOSS IN THE UPPER ATMOSPHERE; (2) TO STUDY GLOBAL ATMOSPHERIC PHOTOCHEMISTRY; (3) TO STUDY DYNAMICS OF THE UPPER ATMOSPHERE; AND (4) TO STUDY THE COUPLING AMONG PROCESSES AND BETWEEN ATMOSPHERIC REGIONS. THE SECOND SPACECRAFT, UARS-2, WITH SIMILAR OBJECTIVES WILL BE LAUNCHED 1 YEAR AFTER UARS-1 INTO A SIMILAR 600-KM CIRCULAR ORBIT, BUT WITH A HIGHER INCLINATION ANGLE. THE PLANNED LIFETIME FOR EACH SPACECRAFT IS 18 MONTHS, BUT THIS MAY BE EXTENDED BY RETRIEVAL OR IN-ORBIT REFURBISHMENT/RESUPPLY BY THE SHUTTLE. THE UARS HAS TWO MAJOR COMPONENTS. THE FIRST IS THE MULTIMISSION MODULAR SPACECRAFT (MMS), DESIGNED AS A STANDARD BUS FOR NASA SPACECRAFT MISSIONS (E.G., SMM AND LANDSAT-D), AND CONSISTING OF FOUR BASIC MODULES: ATTITUDE CONTROL SUBSYSTEM; POWER SUBSYSTEM; COMMUNICATIONS AND DATA HANDLING SUBSYSTEM; AND THE PROPULSION MODULE. THE SECOND MAJOR COMPONENT IS AN INSTRUMENT ASSEMBLY (IA) WHICH IS COMPOSED OF: (1) THE FOUR MICROWAVE ANTENNAS AND THEIR MOMENTUM-COMPENSATING DEVICES; (2) A SOLAR-POINTED INSTRUMENT PLATFORM WITH SOLAR INSTRUMENTS; (3) THE CRYOGENIC LIMB INTERFEROMETER INSTRUMENT; (4) A MODULE COMPRISED OF SMALLER INSTRUMENTS THAT DO NOT REQUIRE CRYOGENIC COOLING; AND (5) A MODULE COMPRISED OF SMALLER INSTRUMENTS THAT CONTAIN CRYOGENS. THE MMS WILL MAINTAIN A PRECISE ORIENTATION TO THE LOCAL VERTICAL AND TO THE VELOCITY VECTOR. THERE ARE THREE ON-BOARD TAPE RECORDERS. THREE NASA STANDARD 50-AMP HOURS NICKEL-CADMIUM BATTERIES WILL FLY ALONG WITH THE SOLAR CELL ARRAY. THE DATA WILL BE RETURNED TO EARTH BY TDRSS. A CENTRAL DATA PROCESSING FACILITY WITH REMOTE PROCESSING AND DISPLAY TERMINALS AT THE INVESTIGATOR'S INSTITUTION IS PLANNED.

----- UARS-1, BRUECKNER-----

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR 120-400 NM

NSSDC ID- UARS-1 -08

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
SOLAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER  
OI - M.E. VAN HOOSIER  
OI - D.K. PRINZ  
OI - J.D.F. BARTOE

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THE MAIN OBJECTIVE OF THIS INVESTIGATION IS TO IMPROVE THE EXISTING ACCURACY OF SOLAR FLUX MEASUREMENTS IN THE 120- TO 400-NM REGION OF THE SPECTRUM AND TO ESTABLISH THE VARIATIONS OF THIS FLUX OVER A SOLAR CYCLE. THE FULL-SUN SPECTRAL IRRADIANCE IS MEASURED WITH TWO SPECTRAL RESOLUTIONS, 0.15 AND 5 NM, WITH AN ABSOLUTE ACCURACY OF PLUS OR MINUS 6-10 PERCENT (WAVELENGTH DEPENDENT). THE ACCURACY OF THE MEASUREMENTS BELOW 210 NM RELATIVE TO MEASUREMENTS OF THE MORE STABLE SOLAR CONTINUUM ABOVE 210 NM IS PLUS OR MINUS 1-5 PERCENT (WAVELENGTH DEPENDENT). THE SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR (SUSIM) CONSISTS OF TWO IDENTICAL DOUBLE DISPERSION SCANNING SPECTROMETERS, SEVEN DETECTORS, AND A DEUTERIUM CALIBRATION LAMP. THE SPECTROMETERS AND DETECTORS ARE SEALED IN A CANISTER FILLED WITH 1.1 ATM OF ARGON GAS. ONE SPECTROMETER IS USED ALMOST CONTINUOUSLY; THE SECOND IS USED INFREQUENTLY TO TRACK THE STABILITY OF THE FIRST. THE DEUTERIUM LAMP SERVES AS A SECONDARY STANDARD FOR IN-FLIGHT CALIBRATION.

----- UARS-1, CARLSON-----

INVESTIGATION NAME- GLIMPSE:GLOBAL LIMB PHOTOMETRIC SCANNING EXPERIMENT

NSSDC ID- UARS-1 -14

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

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**PERSONNEL**

PI - R.W. CARLSON
OI - A.L. FYHAT
OI - E.R. REITER
OI - T.L. YUNG
OI - J.E. LOVILL

NASA-JPL
NASA-JPL
COLORADO STATE U
CALIF INST OF TECH
LAWRENCE LIVERMORE LAB

**PERSONNEL**

PI - M.A. GELLER	U OF MIAMI
OI - E.J. PITCHER	U OF MIAMI
OI - J.E. GEISLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO PRODUCE DAILY GLOBAL MAPS OF VERTICAL OZONE PROFILES IN THE 10- TO 50-KM RANGE, AT 3-KM VERTICAL RESOLUTION AND 500 BY 500 KM HORIZONTAL RESOLUTION WITH 5 PERCENT PRECISION. THE PROFILES ARE OBTAINED BY LIMB SCANS OF THE ATMOSPHERIC RADIANCE, UTILIZING ABSORPTION IN THE VISIBLE CHAPPUIS AND NEAR-UV HARTLEY BANDS TO DETERMINE OZONE ABUNDANCES. THE MEASUREMENTS ARE 'INVERTED' TO GIVE OZONE PROFILES IN THE NEAR-REAL TIME USING A HIGH-SPEED ARRAY PROCESSOR. THE INSTRUMENT CONSISTS OF AN EIGHT-CHANNEL LIMB SCANNING PHOTOMETER TO PROVIDE LIMB RADIANCE PROFILES AND A FOUR-CHANNEL DOWN-LOOKING GROUND/CLOUD ALBEDO SENSOR TO PROVIDE BOUNDARY CONDITIONS FOR THE DATA INVERSION. FOR THE LIMB SCAN PHOTOMETER, THE WAVELENGTH CHANNELS ARE (IN ANGSTROMS): 3000, 3200, 3500, 3800, 4000, 4500, 7000, AND 8000; THE SPECTRAL BANDPASSES ARE 50-250 Å, DEPENDING ON CHANNELS AND LIMB SCAN TIME IS 2.0 S. THE PROJECTED FIELD OF VIEW IS 1 KM DIAMETER. FOR THE GROUND/CLOUD ALBEDO PHOTOMETER THE WAVELENGTH CHANNELS ARE (IN ANGSTROMS) 3200, 5000, 6000, AND 7000. SPECTRAL BANDPASSES ARE 100 Å, AND THE SCAN TIME IS 12 S. THE PROJECTED FIELD OF VIEW IS 50-80 KM.

----- UARS-1, CHANG -----

**INVESTIGATION NAME** - THEORETICAL ANALYSIS-CHEMICAL/RADIATIVE, AND DYNAMICAL PROCESSES-MIDDLE ATMOSPHERE

**NSSDC ID** - UARS-1 -24      **INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - J.S. CHANG	LAWRENCE LIVERMORE LAB
PI - F.R. LUTHER	LAWRENCE LIVERMORE LAB
OI - W.H. DUEWER	LAWRENCE LIVERMORE LAB
OI - J.E. PENNER	LAWRENCE LIVERMORE LAB
OI - D.J. WUEBBLES	LAWRENCE LIVERMORE LAB

**BRIEF DESCRIPTION**

THIS INVESTIGATION STUDIES THE MECHANISMS THAT CONTROL UPPER ATMOSPHERE STRUCTURE VARIABILITY AND THE RESPONSE OF THE UPPER ATMOSPHERE TO NATURAL AND ANTOPOGENIC PERTURBATIONS. THE FOCUS IS ON THE CHEMICAL, RADIATIVE, AND DYNAMICAL PROCESSES IN THE MIDDLE ATMOSPHERE USING TIME-DEPENDENT TRANSPORT-KINETICS MODELS.

----- UARS-1, CUNNOLD -----

**INVESTIGATION NAME** - PREDICTION OF THE DYNAMICAL IMPACT OF CHANGES IN STRATOSPHERIC OZONE

**NSSDC ID** - UARS-1 -18      **INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - D.M. CUNNOLD	GEORGIA INST OF TECH
OI - F.N. ALVEA	MASS INST OF TECH

**BRIEF DESCRIPTION**

THIS INVESTIGATION USES THE UARS DATA TO TEST AND UPDATE A THREE-DIMENSIONAL PHOTOCHEMICAL DYNAMICAL MODEL OF THE STRATOSPHERE. A 32-LEVEL MODEL EXTENDING FROM THE GROUND TO 87 KM AND CONTAINING A HORIZONTAL RESOLUTION APPROXIMATELY EQUIVALENT TO PLANETARY WAVE-NUMBER 18 IS USED IN THIS STUDY. IT CONTAINS THE PREDICTION OF BETWEEN THREE AND SIX LONG-LIVED CHEMICAL SPECIES. A PRINCIPAL GOAL OF THIS MODELING ACTIVITY IS TO ESTIMATE THE DYNAMICAL RESPONSE OF THE ATMOSPHERE TO CHEMICAL PERTURBATIONS, PARTICULARLY THE NATURE OF TRANSPORT IN THE STRATOSPHERE.

----- UARS-1, GELLER -----

**INVESTIGATION NAME** - OBSERVATION-ANALYSIS-THEORETICAL MODELLING INVESTIGATIONS OF DYNAMICS FOR UARS

**NSSDC ID** - UARS-1 -20      **INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
PLANETARY ATMOSPHERES  
METEOROLOGY  
ATMOSPHERIC PHYSICS

**PERSONNEL**

PI - M.A. GELLER	U OF MIAMI
OI - E.J. PITCHER	U OF MIAMI
OI - J.E. GEISLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE MAJOR GOALS OF THIS INVESTIGATION ARE: (1) TO CONSTRUCT A SIMULATION OF UPPER ATMOSPHERE FLOW REGIMES AND UTILIZE THE PROPOSED UARS OBSERVING PARAMETERS TO STUDY THE RESOLVABILITY OF UPPER ATMOSPHERE DYNAMICS BY THE UARS INSTRUMENTS AND SUBSEQUENT DATA ANALYSIS; (2) TO USE PRE-UARS LIMB SCANNING DATA FOR THE STRATOSPHERE AND MESOSPHERE FOR GENERAL CIRCULATION STUDIES; (3) TO ASSESS THE EXTENT TO WHICH UPPER ATMOSPHERE DATA MUST BE INCLUDED IN STUDIES OF TROPOSPHERIC CLIMATE AND IN EXTENDED RANGE FORECASTING; AND (4) TO PURSUE A THEORETICAL MODELING EFFORT ON STRATOSPHERIC/MESOSPHERIC DYNAMICS AND ITS RELATION TO TROPOSPHERIC DYNAMICS.

----- UARS-1, GILLE -----

**INVESTIGATION NAME** - ADVANCED LIMB SCANNER

**NSSDC ID** - UARS-1 -10      **INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.C. GILLE	NATL CTR FOR ATMOS RES
PI - J.M. RUSSELL, 3RD	NASA-LARC
OI - R.J. CICERONE	U OF CALIF, SAN DIEGO
OI - P.J. CRUTZEN	NATL CTR FOR ATMOS RES
OI - M.A. GELLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE ADVANCED LIMB SCANNER (ALS) EXPERIMENT HAS AS ITS OBJECTIVE MEASUREMENT OF THE VERTICAL AND HORIZONTAL DISTRIBUTIONS OF IMPORTANT TRACE GASES IN THE UPPER ATMOSPHERE, INCLUDING O<sub>3</sub>, NO<sub>2</sub>, HNO<sub>3</sub>, N<sub>2</sub>O, H<sub>2</sub>O, AND CH<sub>4</sub>; AND TEMPERATURE MEASUREMENT IN THE 8- TO 75-KM ALTITUDE RANGE WITH A 1 DEG K RMS ERROR FOR ALTITUDE LESS THAN 50 KM. A MULTISPECTRAL INTERFERENCE FILTER RADIOMETER WITH ELEVATION SCAN AND TWO-AZIMUTH POSITION CAPABILITY IS USED AND THE MEASUREMENT TECHNIQUE INVOLVES THE INVERSION OF THE MEASURED RADIANCE PROFILES. INSTANTANEOUS VERTICAL FIELDS OF VIEW (IFOV) ARE LESS THAN 2 KM IN ALL EXCEPT TWO CHANNELS WHICH ARE DESIGNED FOR LOW ALTITUDE SENSING. FOR THESE CHANNELS THE IFOV IS LESS THAN 1 KM. THE SPECTRAL RANGE OF APPROXIMATELY 6 TO 10 MICRONS IS COVERED WITH CHANNELS RANGING IN RESOLUTION FROM 80 TO 220 INVERSE CENTIMETERS. THE INSTRUMENT USES MERCURY-CADMIUM-TELLURIDE DETECTORS COOLED TO 80 DEG K.

----- UARS-1, GILLE -----

**INVESTIGATION NAME** - CRYOGENIC UPPER-ATMOSPHERE LIMB EMISSION RADIOMETER

**NSSDC ID** - UARS-1 -12      **INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.C. GILLE	NATL CTR FOR ATMOS RES
PI - W.G. MANKIN	NATL CTR FOR ATMOS RES
PI - R.G. ROBLE	NATL CTR FOR ATMOS RES
OI - P.J. CRUTZEN	NATL CTR FOR ATMOS RES
OI - M.T. COFFEY	NATL CTR FOR ATMOS RES
OI - J.R. HOLTON	U OF WASHINGTON
OI - V.G. KUNDE	NASA-GSFC
OI - D.G. MURCRAY	U OF DENVER
OI - J.M. RUSSELL, 3RD	NASA-LARC
OI - A.T. STAIR, JR.	USAF GEOPHYS LAB
OI - M.A. GELLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVE IS TO OBTAIN MEASUREMENTS, THE INVERSION OF WHICH PROVIDES MORE DETAILED AND COMPREHENSIVE GLOBAL MAPS OF TEMPERATURE, TRACE SPECIES, AND EMISSION FEATURES OVER THE 10- TO 120-KM RANGE. THE CRYOGENIC UPPER ATMOSPHERE LIMB EMISSION RADIOMETER (CULER) IS A CRYOGENICALLY COOLED TELESCOPE OF 15-CM APERTURE WITH A LIMB SCANNING MIRROR FEEDING A 24-CHANNEL RADIOMETER AND A CIRCULAR VARIABLE FILTER (CVF) SPECTROMETER. THE FIXED RADIOMETRIC CHANNELS, SELECTED BY GRATING-FILTER COMBINATIONS BETWEEN 370-7000 INVERSE CENTIMETER (1.5 TO 27 MICRONS), ARE TAILORED FOR SPECIFIC MEASUREMENTS E.G., TEMPERATURE SOUNDING, CONCENTRATION OF PREDETERMINED CHEMICAL SPECIES, OR EMISSIONS FROM SPECIFIC EXCITATION MECHANISMS. THE SPECTRALLY SELECTIVE CVF HAS 1 PERCENT RESOLUTION BETWEEN 660-5000 INVERSE CENTIMETER.

----- UARS-1, GRAYSTONE -----

INVESTIGATION NAME- THEORETICAL INVESTIGATION PHYSICS,  
CHEMISTRY, AND DYNAMICS-STRATOSPHERE

NSSDC ID- UARS-1 -25

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - P. GRAYSTONE

METEOROLOGICAL OFFICE

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE TO FURTHER THE UNDERSTANDING OF THE STRATOSPHERE AND TO STUDY ITS INTERACTIONS WITH THE TROPOSPHERE. THESE OBJECTIVES ARE ACHIEVED THROUGH TWO PRIMARY ACTIVITIES, ANALYSIS AND DIAGNOSIS. A COMPREHENSIVE THREE DIMENSIONAL NUMERICAL MODEL OF THE TROPOSPHERE AND STRATOSPHERE IS USED.

----- UARS-1, GROSE -----

INVESTIGATION NAME- STRATOSPHERIC TRANSPORT PROCESSES-BUDGETS  
OF MINOR CONSTITUENTS, AND ENERGETICS

NSSDC ID- UARS-1 -22

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - J.L. GROSE  
OI - W.T. BLACKSHEAR  
OI - K.V. HAGGARD  
OI - E.E. REMSBERG  
OI - R.F. TURNER  
OI - R.J. KURZEA

NASA-LARC  
NASA-LARC  
NASA-LARC  
NASA-LARC  
NASA-LARC  
GEORGE WASHINGTON U

BRIEF DESCRIPTION

THIS INVESTIGATION IS A COORDINATED PROGRAM OF THEORETICAL MODEL STUDIES AND DATA ANALYSIS, AND INTERPRETATION DESIGNED TO STUDY TRANSPORT PROCESSES, BUDGETS OF TRACE CHEMICALS, AND ENERGETICS OF THE STRATOSPHERE. THE FIRST PART OF THIS EFFORT IS DEVOTED TO THE STUDY OF THE TRANSPORT OF MINOR CONSTITUENTS, HEAT, MOMENTUM, AND POTENTIAL VORTICITY IN THE STRATOSPHERE. THE SECOND PART UTILIZES UARS DATA TO STUDY BUDGETS OF TRACE CHEMICALS BY DETERMINING BULK MASS TRANSFER RATES WITHIN THE STRATOSPHERE AND AMONG THE STRATOSPHERE, TROPOSPHERE, AND MESOSPHERE. THE LAST PART OF THIS EFFORT IS AN ANALYSIS OF THE STRATOSPHERE ENERGETICS.

----- UARS-1, HAYS -----

INVESTIGATION NAME- HIGH RESOLUTION DOPPLER IMAGER (HRDI)

NSSDC ID- UARS-1 -02

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - P.B. HAYS  
OI - G. HERNANDEZ  
OI - D. REES  
OI - R.G. ROBLE

U OF MICHIGAN  
NOAA-ERL  
U COLLEGE LONDON  
NATL CTR FOR ATOMS RES

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO USE A HIGH RESOLUTION DOPPLER IMAGING FABRY-PEROT INTERFEROMETER DETECTING SHARP FEATURES IN THE SPECTRUM OF LIGHT EMITTED OR SCATTERED FROM THE EARTH'S ATMOSPHERE TO OBTAIN THE TEMPERATURE AND VECTOR WIND FIELD DIRECTLY. THE INFORMATION OBTAINED WILL BE USED TO STUDY A SERIES OF PROBLEMS ASSOCIATED WITH THE DYNAMICS OF THE ATMOSPHERE AND THE TRANSPORT OF MINOR CONSTITUENTS WITHIN THE ATMOSPHERE. THERE IS A SINGLE SENSOR CONTAINING THE SPECTRAL FILTERS AND THE MAIN OBJECTIVE TELESCOPE WHICH CAN VIEW THE EARTH'S HORIZON THROUGH EITHER OF TWO ORTHOGONAL BAFFLE SYSTEMS. SWITCHING BETWEEN THESE BAFFLES IS ACCOMPLISHED BY ROTATING THE ZENITH SCAN MIRROR THROUGH 90 DEG. HORIZONTAL SCANNING IS ACCOMPLISHED BY TILTING THIS MIRROR THROUGH 7.5 DEG IN THE ZENITH DIRECTION.

----- UARS-1, HEELIS -----

INVESTIGATION NAME- ION CONVECTION ELECTRODYNAMICS

NSSDC ID- UARS-1 -06

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - R.A. HEELIS	U OF TEXAS, DALLAS
OI - W.B. MANSON	U OF TEXAS, DALLAS
OI - J.H. HOFFMAN	U OF TEXAS, DALLAS
OI - C.R. LIPPENCOTT	U OF TEXAS, DALLAS
OI - R.G. ROBLE	NATL CTR FOR ATOMS RES
OI - E.L. BREIG	U OF TEXAS, DALLAS
OI - D.R. ZUCCARO	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE: (1) TO MEASURE THE ION VELOCITY FIELD ALONG THE ORBIT TRACK, FROM WHICH THE CORRESPONDING IONOSPHERIC ELECTRIC FIELDS MAY BE DERIVED; (2) TO USE THE DERIVED ELECTRIC FIELDS, TOGETHER WITH WIND, PARTICLE FLUX, AND MAGNETIC FIELD DATA, TO CONSTRUCT MODELS OF THE HIGH LATITUDE POTENTIAL DISTRIBUTION AND HEAT INPUT FROM BOTH PARTICLE AND JOULE HEATING; (3) TO USE THE MODEL HEATING AND ION-NEUTRAL MOMENTUM TRANSFER AS INPUTS TO GLOBAL MODELS OF ATMOSPHERIC CHEMISTRY AND DYNAMICS; AND (4) TO USE THE DERIVED GLOBAL ELECTRIC FIELD DISTRIBUTIONS TO CONSTRUCT MODELS THAT WILL REVEAL THE INTERPLAY BETWEEN THE SOLAR WIND, THUNDERSTORM ACTIVITY, AND IONOSPHERIC ELECTRIC FIELDS. THE ION CONVECTION ELECTRODYNAMICS (ICE) INSTRUMENT MAKES THE FOLLOWING MEASUREMENTS: (1) BULK ION VELOCITY (ALL COMPONENTS ARE MEASURED TO 5 PERCENT). THE SENSITIVITY IS 10 M/SEC FOR THE RAM COMPONENT AND 2 M/S FOR THE HORIZONTAL AND VERTICAL COMPONENTS. THE SAMPLING DISTANCES FOR THE RAM, HORIZONTAL, AND VERTICAL COMPONENTS ARE LESS THAN 8 KM, APPROXIMATELY 250 M, AND 500 M, RESPECTIVELY; (2) THE ION TEMPERATURE (MEASURED IN THE RANGE 200 TO 20,000 DEG K WITH AN ACCURACY OF PLUS OR MINUS 3 PERCENT, AND AT A SAMPLING DISTANCE OF LESS THAN 8 KM); (3) ION CONCENTRATIONS (MEASURED OVER THE RANGE 10 TO 1.0E6 PER CUBIC CM WITH AN ACCURACY OF PLUS OR MINUS 5 PERCENT), AT A SAMPLING DISTANCE OF ABOUT 500 M; (4) ELECTRON TEMPERATURE (MEASURED OVER THE RANGE FROM 300 TO 20,000 DEG K, WITH AN ACCURACY OF PLUS OR MINUS 10 PERCENT AND AT A SAMPLING DISTANCE OF LESS THAN 60 KM).

----- UARS-1, HOLTON -----

INVESTIGATION NAME- WAVE DYNAMICS AND TRANSPORT IN THE MIDDLE ATMOSPHERE

NSSDC ID- UARS-1 -17

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.R. HOLTON	U OF WASHINGTON
OI - J.M. WALLACE	U OF WASHINGTON
OI - D.L. HARTMANN	U OF WASHINGTON
OI - R.E. YOUNG	NASA-ARC
OI - C.B. LEOTY	U OF WASHINGTON

BRIEF DESCRIPTION

THIS INVESTIGATION USES A PROGRAM OF OBSERVATIONAL ANALYSIS AND NUMERICAL MODELING DESIGNED TO ELUCIDATE THE NATURE OF THE GENERAL CIRCULATION OF THE MIDDLE ATMOSPHERE, THE ROLE OF DYNAMICS IN CONTROLLING THE DISTRIBUTION AND VARIABILITY OF VARIOUS TRACE CONSTITUENTS, AND THE NATURE AND EXTENT OF DYNAMICAL INTERACTIONS BETWEEN THE LOWER AND MIDDLE ATMOSPHERES. EMPHASIS IS PLACED ON THE ROLES WHICH LARGE-SCALE WAVE MOTIONS PLAY IN MAINTAINING THE BUDGETS OF MOMENTUM, HEAT, AND TRACE CONSTITUENT CONCENTRATIONS ON A GLOBAL BASIS IN THE MIDDLE ATMOSPHERE.

----- UARS-1, HOUGHTON -----

INVESTIGATION NAME- AN IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER (ISAMS)

NSSDC ID- UARS-1 -11

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.T. HOUGHTON	OXFORD U
OI - R. MUNNEMAN	READING U
OI - H. HADLEY	RUTHERFORD HIGH EN LAB
OI - K.H. DAVIES	RUTHERFORD HIGH EN LAB
OI - G.D. PFSKETT	OXFORD U
OI - C.D. RODGERS	OXFORD U
OI - F.J. WILLIAMSON	OXFORD U
OI - J.J. BARNETT	OXFORD U
OI - J.G. WHITNEY	OXFORD U
OI - C.A. BAILEY	OXFORD U
OI - G.R. THORTON	OXFORD U
OI - J.S. SEELEY	READING U

**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVE IS TO MAKE GLOBAL MEASUREMENTS OF RADIATION FROM CO<sub>2</sub>, H<sub>2</sub>O, CO, NO, N<sub>2</sub>O, AND CH<sub>4</sub>. THESE MEASUREMENTS YIELD: THE KINETIC TEMPERATURE, VIBRATIONAL TEMPERATURE, AND ALTITUDE DISTRIBUTION FOR CO<sub>2</sub>; (2) THE H<sub>2</sub>O CONCENTRATION FROM 15 TO 110 KM; (3) THE CO ALTITUDE DISTRIBUTION; (4) THE NO ALTITUDE DISTRIBUTION; (5) THE N<sub>2</sub>O ALTITUDE DISTRIBUTION; AND (6) THE CH<sub>4</sub> ALTITUDE DISTRIBUTION. THESE PARAMETERS ARE OBTAINED AS A FUNCTION OF TIME AND LOCATION. THE IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER IS AN INFRARED RADIOMETER OBSERVING THERMAL EMISSION AND RESONANCE FLUORESCENCE OF SOLAR RADIATION FROM THE ATMOSPHERIC LIMB BY GAS CORRELATION SPECTROSCOPY. THE SPECTRAL RANGE COVERED IS 2.7 TO 100 MICRORAMETERS. THE ALTITUDE RANGE EXTENDS FROM 15 TO 140 KM, DEPENDING UPON THE PARTICULAR SPECIES MEASURED. FOR MOST CHANNELS, VERTICAL PROFILES OF TEMPERATURE (TO APPROXIMATELY 1 DEG K ACCURACY) AND COMPOSITION (TO APPROXIMATELY 10 PERCENT) CAN BE MADE WITH A VERTICAL RESOLUTION BETTER THAN 4 KM AND A HORIZONTAL RESOLUTION OF 400 KM (LIMITED BY GEOMETRY OF LIMB FATH).

----- UARS-1, LONDON -----

**INVESTIGATION NAME** - RESPONSE OF UPPER ATMOSPHERE PARAMETERS TO VARIATIONS OF SOLAR ACTIVITY

NSSDC ID - UARS-1 -14

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - J. LONDON

U OF COLORADO

**BRIEF DESCRIPTION**

THIS INVESTIGATION DEALS WITH THE NATURAL VARIABILITY OF THE THERMAL STRUCTURE AND OZONE CONCENTRATION OF THE UPPER ATMOSPHERE WITH EMPHASIS ON THEIR RESPONSE TO SIGNIFICANT SOLAR VARIABILITY. IT PROVIDES DEFINITIVE TESTS FROM ANALYSIS OF RETRIEVED DATA OF SPECIFIED MECHANISMS BY WHICH OZONE VARIATIONS ARE IN RESPONSE TO VARIATIONS IN SOLAR ACTIVITY. A TWO-FOLD APPROACH IS USED: DATA ANALYSIS AND STATISTICAL EVALUATION OF THE PERTINENT UPPER ATMOSPHERE PARAMETERS AS THEY RELATE TO VARIOUS FORMS OF SOLAR ACTIVITY; AND THEORETICAL STUDY OF THE SENSITIVITY OF REALISTIC MODELS OF THE OZONE PHOTOCHEMICAL EQUILIBRIUM SYSTEM AS RELATED TO OBSERVED AND SUGGESTED SOLAR VARIABILITY.

----- UARS-1, MILLER -----

**INVESTIGATION NAME** - SYNOPTIC ANALYSIS+DYNAMICAL INTERPRETA. OF UARS METEOROLOGICAL INFORMATION

NSSDC ID - UARS-1 -16

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**PI - A.J. MILLER  
PI - R.S. QUIROZ

NOAA-NMC

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MERGE TEMPERATURE AND WIND MEASUREMENTS IN THE STRATOSPHERE AND MESOSPHERE WITH THE OPERATIONAL NATIONAL WEATHER SERVICE ANALYSES. ENERGY BUDGET TERMS ARE EVALUATED AND HEIGHT AND TEMPERATURE FIELDS (PLANETARY WAVES) ARE ANALYZED BY FOURIER ANALYSIS. THE INTERLAYER DYNAMIC COUPLING AMONG THE TROPOSPHERE, STRATOSPHERE, AND MESOSPHERE ALSO IS STUDIED.

----- UARS-1, MOUNT -----

**INVESTIGATION NAME** - ULTRAVIOLET OZONE SPECTROMETER

NSSDC ID - UARS-1 -03

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**PI - G.H. MOUNT  
OI - C.A. BARTH  
OI - C.W. HORD  
OI - D.W. RUSCHU OF COLORADO  
U OF COLORADO  
U OF COLORADO  
U OF COLORADO**BRIEF DESCRIPTION**

THE OBJECTIVES OF THIS INVESTIGATION ARE TO MEASURE THE OZONE DENSITY IN THE ALTITUDE RANGE FROM 40 TO 90 KM, BY OBSERVING THE ATTENUATION OF RAYLEIGH SCATTERED SUNLIGHT IN THE NEAR ULTRAVIOLET AT WAVELENGTHS FROM 2400 TO 3400 Å; AND TO DETERMINE THE NITRIC OXIDE (NO) DENSITY IN THE ALTITUDE RANGE FROM 80 TO 250 KM BY OBSERVING THE SUNLIGHT FLUORESCENTLY SCATTERED IN THE NO GAMMA BANDS AT 2100 TO 2400 Å. THE FLIGHT INSTRUMENT WILL BE A 250-MM FOCAL LENGTH OFF-AXIS, PARAPOLIC

TELESCOPE AND DUAL CHANNEL 1/8-M FIBER-FASTIE SPECTROGRAPH EMPLOYING TWO PHOTOMULTIPLIER TUBES OPERATING IN THE SPECTRAL RANGES 2100-3100 Å AND 2400-3400 Å AT 20-Å RESOLUTION. THE INSTRUMENT IS MOUNTED ONTO A SCAN PLATFORM, ALLOWING SCANNING OF THE EARTH'S LIMB IN 3-KM HEIGHT INCREMENTS IN A TIME PERIOD OF 12 S. OPERATING MODES INCLUDE (1) SIMULTANEOUS INTENSITY MEASUREMENTS AT TWO WAVELENGTHS SEPARATED BY APPROXIMATELY 300 Å (ONE WHERE THE OZONE ABSORPTION IS STRONG AND ONE WHERE IT IS WEAK AS THE SCAN PLATFORM SCANS THE EARTH'S LIMB), AND (2) MEASUREMENT OF THE GAMMA BANDS IN THE RANGE 2150 TO 2450 Å AS THE INSTRUMENT IS SCANNED THROUGH THE EARTH'S LIMB.

----- UARS-1, REBER -----

**INVESTIGATION NAME** - ANALYTIC-EMPIRICAL MODELING OF UPPER ATMOSPHERE PARAMETERS

NSSDC ID - UARS-1 -21

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**PI - C.A. REBER  
OI - F.T. HUANG  
OI - A.E. HEDIN  
OI - J.E. FREDERICK  
OI - J. LONDON  
OI - E. HILSENRAHNASA-GSFC  
COMPUTER SCIENCES CORP  
NASA-GSFC  
NASA-GSFC  
U OF COLORADO  
NASA-GSFC**BRIEF DESCRIPTION**

THE PRIMARY OBJECTIVES OF THIS INVESTIGATION ARE THE ORGANIZATION, EMPIRICAL MODELING, AND GEOPHYSICAL INTERPRETATION OF THE VARIOUS DATA ACQUIRED FROM THE UARS. A SECONDARY OBJECTIVE IS THE ACQUISITION OF COMPLEMENTARY DATA FROM OTHER SOURCES (E.G., THE OPERATIONAL NOAA SATELLITES) FOR USE IN THIS ANALYSIS AND FOR USE BY THE UARS SCIENCE TEAM. A SUBSTANTIAL PART OF THE INVESTIGATION IS THE CALCULATION OF A TIME-DEPENDENT THREE-DIMENSIONAL ANALYTIC-EMPIRICAL MODEL USING DATA ON ATMOSPHERIC TEMPERATURE, MINOR SPECIES MIXING RATIOS, ETC. THE MODELING TECHNIQUE IS A DIRECT FOLLOW-UP TO THE "OGO MODEL" AND THE "MASS SPECTROMETER-INCOHERENT SCATTER (MSIS) MODEL", WHICH HAVE PROVEN QUITE SUCCESSFUL FOR THERMOSPHERIC RESEARCH, AND TO THE CURRENT EMPIRICAL OZONE MODEL, ALL OF WHICH WERE DEVELOPED AND ARE AVAILABLE AT THE GODDARD SPACE FLIGHT CENTER, CODE 690, GREENBELT, MD 20771.

----- UARS-1, ROCHE -----

**INVESTIGATION NAME** - ALTITUDE DISTRIBUTION OF ATMOSPHERIC MINOR SPECIES AND TEMP. IN 10-60KM RANGE

NSSDC ID - UARS-1 -05

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
METEOROLOGY  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES

**PERSONNEL**PI - A.E. ROCHE  
OI - J.R. KUMER  
OI - R.D. SEARS  
OI - T.C. JAMES  
OI - L.R. MEGILL  
OI - K.D. RAKER  
OI - D.G. MURRAY  
OI - A. GOLDMANLOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
UTAH STATE U  
UTAH STATE U  
U OF DENVER  
U OF DENVER**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVES ARE TO REMOTELY MEASURE THE STRATOSPHERIC COMPOSITION (H<sub>2</sub>O, N<sub>2</sub>O, NO<sub>x</sub>, CL<sub>2</sub>, ClO, HCl, O<sub>3</sub>, CO<sub>2</sub>, AND CH<sub>4</sub>) AND TEMPERATURE IN THE 10- TO 60-KM ALTITUDE RANGE. THE COMPOSITION AND TEMPERATURE ARE DETERMINED FROM MEASUREMENTS OF LIMB EMISSION SPECTRA IN THE 3.5- TO 12-MICRORAM WAVELENGTH RANGE. THE NECESSARY HIGH SENSITIVITY, BACKGROUND FLUX DISCRIMINATION, AND SPECTRAL RESOLUTION ARE PROVIDED BY A CRYOGENICALLY COOLED SOLID ETALON SPECTROMETER USING A LINEAR DETECTOR ARRAY TO SIMULTANEOUSLY COVER THE 10- TO 60-KM RANGE WITH 2-KM RESOLUTION. THE SPECTRAL RESOLUTION IS 0.25 INVERSE CENTIMETER. THREE DAYS ARE REQUIRED TO ACHIEVE GLOBAL COVERAGE WITHIN THE 75 DEG LATITUDE FOR THE 57 DEG UMBIT.

----- UARS-1, ROTTMAN -----

**INVESTIGATION NAME** - ULTRAVIOLET SOLAR SPECTRAL IRRADIANCE EXPERIMENT

NSSDC ID - UARS-1 -04

**INVESTIGATIVE PROGRAM**  
CODE EB

**INVESTIGATION DISCIPLINE(S)**  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
SOLAR PHYSICS

**PERSONNEL**  
 PI - G.J. ROTTMAN  
 OI - J. LONDON

U OF COLORADO  
 U OF COLORADO

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE THE SOLAR SPECTRUM AT WAVELENGTHS BETWEEN 120 AND 500 NM WITH AN ABSOLUTE ACCURACY BETTER THAN 10 PERCENT. TEMPORAL VARIATIONS OF THE SOLAR RADIATION ARE FOLLOWED TO WITHIN 1-2 PERCENT DURING THESE MISSIONS. THERE IS A 1/8 M EBERT-FASTIE SPECTROMETER WITH APPROXIMATELY 0.15-NM SPECTRAL RESOLUTION ON BOARD. IT HAS THREE SEPARATE DATA CHANNELS, EACH USING A PHOTOTUBE OPTIMIZED FOR DIFFERENT, BUT OVERLAPPING, PORTIONS OF THE INSTRUMENT SPECTRAL RANGE. SOLAR DATA ARE TAKEN ON A DAILY BASIS AND ANALYZED TO ESTABLISH CORRELATIONS OF THE SPECTRAL IRRADIANCE WITH SOLAR ROTATION AND WITH SOLAR ACTIVITY (10.7-CM FLUX LEVELS, SUNSPOT NUMBER, CALCIUM PLAGE, SOLAR FLARES, ETC.). THE NORMAL MODE OF OPERATION INVOLVES A 4-H DUTY CYCLE PER DAY. OF THIS TOTAL TIME, 1 H IS SPENT OBSERVING THE SUN AND THE REMAINDER OF THE TIME IS SPENT IN CALIBRATION ACTIVITIES. TEN TO 15 STARS ARE CHOSEN FOR THE CALIBRATION PROGRAM.

----- UARS-1, RUSSELL, 3RD -----

INVESTIGATION NAME- HALOGEN OCCULTATION EXPERIMENT (HALOE)

NSSDC ID- UARS-1 -09

INVESTIGATIVE PROGRAM  
 CODE EB

INVESTIGATION DISCIPLINE(S)  
 ATMOSPHERIC PHYSICS  
 METEOROLOGY  
 PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.M. RUSSELL, 3RD	NASA-LARC
OI - J. PARK	COLL OF WILLIAM + MARY
OI - S.R. DRAYSON	U OF MICHIGAN
OI - P.J. CRUTZEN	NATL CTR FOR ATMOS RES
OI - R.J. CICERONE	U OF CALIF, SAN DIEGO
OI - P.L. HANST	ENVIRON PROTECT AGENCY

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE, USING SOLAR OCCULTATION TECHNIQUES, THE UPPER ATMOSPHERIC VERTICAL CONCENTRATION PROFILES OF: H<sub>2</sub>O, O<sub>3</sub>, HCl, HF, NO, CH<sub>4</sub>, HNO<sub>3</sub>, AND CO<sub>2</sub>. PRESSURE IN THE ALTITUDE RANGE FROM 10 TO 55 KM IS MEASURED. MEASUREMENTS ARE USED TO STUDY TRACE GAS SOURCES AND SINKS AND UPPER ATMOSPHERE TRANSPORT, AND TO VALIDATE PHOTOCHEMICAL AND ATMOSPHERIC DYNAMICS MODELS. A FOUR-CHANNEL GAS FILTER CORRELATION RADIOMETER AND A FIVE-CHANNEL FILTER RADIOMETER MOUNTED ON A COMMON CHASSIS WITH AZIMUTH AND ELEVATION CAPABILITY ARE USED. THE GAS FILTER CORRELATION RADIOMETRY IS USED TO MEASURE THE HCl, HF, CH<sub>4</sub>, NO, AND CO<sub>2</sub>, AND BROAD BAND FILTER SPECTROSCOPY IS USED TO MEASURE H<sub>2</sub>O, O<sub>3</sub>, HNO<sub>3</sub>, AND CO<sub>2</sub>. THE CO<sub>2</sub> DATA ARE USED TO OBTAIN THE ATMOSPHERIC PRESSURE PROFILE.

----- UARS-1, THUILLIER -----

INVESTIGATION NAME- TEMPERATURE AND WIND MEASUREMENT IN THE MESOSPHERE AND LOWER THERMOSPHERE

NSSDC ID- UARS-1 -01

INVESTIGATIVE PROGRAM  
 CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
 ATMOSPHERIC PHYSICS  
 PLANETARY ATMOSPHERES  
 METEOROLOGY

**PERSONNEL**

PI - G. THUILLIER	CNRS-SA
OI - P. CONNES	PARIS OBSERVATORY
OI - H. TEITELBAUM	CNRS-SA
OI - M.L. DUBBIN	CNET
OI - P. BLUM	U OF BONN
OI - S.S. CHANDRA	NASA-GSFC

**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVES ARE TO MEASURE SIMULTANEOUSLY THE WIND AND TEMPERATURE IN THE HIGH MESOSPHERE AND LOW THERMOSPHERE, AND TO DERIVE THE EDDY DIFFUSION COEFFICIENT USING A REMOTE SENSING METHOD. ABSOLUTE LINE INTENSITIES ARE ALSO MEASURED. THE FLIGHT INSTRUMENT IS COMPOSED OF TWO MAIN UNITS. THE UPPER PART IS A CASSEGRAIN-TYPE TELESCOPE. THE LOWER PART CONSISTS OF A FIELD-COMPENSATED MICHELSON INTERFEROMETER AND ASSOCIATED OPTICS, DETECTORS, LASER UNIT, ELECTROMECHANISMS, AND ELECTRONS. THE WAVELENGTHS MEASURED (IN ANGSTROMS) ARE: 5577, 6300, 7278, 7319, AND 7371. THE SPECTRAL SCANNING IS ACHIEVED BY A SMALL-ANGLE PRISM CHANGING THE OPTICAL PATH OF APPROXIMATELY 1 WAVELENGTH IN 16 STEPS. THE LIMB IS SLANDED IN STEPS FROM 400 TO 70 KM. THE FIELD OF VIEW IS 2 DEG IN A HORIZONTAL PLANE AND THE VERTICAL FIELD OF VIEW VARIES FROM 16 ARC-MIN IN THE THERMOSPHERE, TO 4 ARC-MIN FOR MESOSPHERIC OBSERVATIONS. THE DURATION OF A COMPLETE SCAN FOR A GIVEN LINE IS 1.6 S.

----- UARS-1, TORR -----

INVESTIGATION NAME- ULTRAVIOLET STRATOSPHERIC IMAGING SPECTROMETER

NSSDC ID- UARS-1 -15

INVESTIGATIVE PROGRAM  
 CODE EB

INVESTIGATION DISCIPLINE(S)  
 ATMOSPHERIC PHYSICS  
 METEOROLOGY  
 PLANETARY ATMOSPHERES

**PERSONNEL**

PI - D.G. TORR	U OF MICHIGAN
OI - M.R. TORR	U OF MICHIGAN
OI - T.M. DONAHUE	U OF MICHIGAN
OI - A.F. NAGY	U OF MICHIGAN
OI - E.R. YOUNG	U OF MICHIGAN
OI - S.C. LIU	NOAA
OI - R.J. CICERONE	U OF CALIF, SAN DIEGO

**BRIEF DESCRIPTION**

THE PRIMARY OBJECTIVE OF THIS INVESTIGATION IS TO MAKE HIGH RESOLUTION STUDIES OF TRACE CONSTITUENTS IN THE MIDDLE ATMOSPHERE. THE CONSTITUENTS ARE OBSERVED THROUGH ABSORPTION OF RAYLEIGH SCATTERED SUNLIGHT, RESONANCE FLUORESCENCE OF SUNLIGHT AT ULTRAVIOLET WAVELENGTHS, CHEMILUMINESCENCE, AND PARTICLE IMPACT EXCITATION. THE INVESTIGATION ALSO MONITORS PARTICLE PRECIPITATION FROM THE INCLUDED EMISSIONS AT 3914 AND 4278A. AN ECHELLE GRATING SPECTROGRAPH MEASURES THE CONCENTRATIONS OF THE TRACE CONSTITUENTS, O<sub>3</sub>, OH, ClO, NO, AND NO<sub>2</sub> AT STRATOSPHERIC AND MESOSPHERIC ALTITUDES. A HIGH-RESOLUTION (0.04A) ATLAS WILL BE COMPILED IN BOTH ABSORPTION AND EMISSION. THE WAVE LENGTH RANGE IS 2000 TO 4600A. THE IMAGING CAPABILITY PERMITS A 50-KM ALTITUDE PROFILE (E.G., 20 TO 70 KM) TO BE OBSERVED SIMULTANEOUSLY AT 5-KM RESOLUTION.

----- UARS-1, WATERS -----

INVESTIGATION NAME- MICROWAVE LIMB SOUNDER (MLS)

NSSDC ID- UARS-1 -13

INVESTIGATIVE PROGRAM  
 CODE EB

INVESTIGATION DISCIPLINE(S)  
 PARTICLES AND FIELDS  
 METEOROLOGY  
 PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.W. WATERS	NASA-JPL
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**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE WIND, O<sub>3</sub>, ClO, H<sub>2</sub>O<sub>2</sub>, TEMPERATURE, O<sub>2</sub>, CO, H<sub>2</sub>O, MAGNETIC FIELD, AND PRESSURE IN THE UPPER ATMOSPHERE. THE SPECTRAL REGION COVERED IS FROM 63 TO 231 GHZ. THE SAMPLED ALTITUDE RANGE EXTENDS FROM 15 TO 110 KM. THE INSTRUMENT HAS 2-S INTEGRATION WITH LONGER INTEGRATIONS PERFORMED AS APPROPRIATE DURING DATA REDUCTION. ABSOLUTE ACCURACY OF THIS MICROWAVE LIMB SOUNDER (MLS) IS APPROXIMATELY 5 PERCENT FOR COMPOSITION, APPROXIMATELY 2 DEG K FOR TEMPERATURE, AND APPROXIMATELY 3 M/S FOR WINDS. VERTICAL RESOLUTION FOR PROFILE MEASUREMENTS IS 3-6 KM; HORIZONTAL RESOLUTION IS 30 KM ACROSS AND 300 KM ALONG THE OBSERVATION DIRECTION. COMPLETE PROFILES ARE OBTAINED IN LESS THAN 50 S.

----- UARS-1, WINNINGHAM -----

INVESTIGATION NAME- PARTICLE ENVIRONMENT MONITOR (PEM)

NSSDC ID- UARS-1 -07

INVESTIGATIVE PROGRAM  
 CODE EB

INVESTIGATION DISCIPLINE(S)  
 IONOSPHERES  
 PLANETARY ATMOSPHERES  
 PARTICLES AND FIELDS

**PERSONNEL**

PI - J.D. WINNINGHAM	U OF TEXAS, DALLAS
OI - P.M. BANKS	UTAH STATE U
OI - J.L. BURCH	SOUTHWEST RES INST
OI - R.G. GUNTON	LOCKHEED PALO ALTO
OI - W.L. IMHOFF	LOCKHEED PALO ALTO
OI - J.B. REAGAN	LOCKHEED PALO ALTO
OI - M.H. REES	U OF ALASKA
OI - G.C. REID	NOAA
OI - R.G. ROBLE	NATL CTR FOR ATMOS RES
OI - P.J. CRUTZEN	NATL CTR FOR ATMOS RES

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO DETERMINE THE GLOBAL INPUT OF CHARGED PARTICLE ENERGY INTO THE EARTH'S STRATOSPHERE, MESOSPHERE, AND THERMOSPHERE AND THE PREDICTED ATMOSPHERIC PROCESSES. DIRECT IN SITU MEASUREMENTS OF PRECIPITATION ELECTRONS IN THE ENERGY RANGE FROM 100 EV TO 1 MEV AND OF PROTONS IN THE ENERGY RANGE FROM 0.5 TO 200 MEV (WITH OPTION OF EXTENDING PROTON MEASUREMENTS DOWN TO 100 EV) ARE MADE WITH A MEDIUM ENERGY PARTICLE SPECTROMETER (MEPS) AND A HIGH ENERGY PARTICLE SPECTROMETER (HEPS). IN ADDITION, GLOBAL IMAGES AND ENERGY SPECTRA OF ATMOSPHERIC X RAYS PRODUCED BY ELECTRON PRECIPITATION ARE PERFORMED OVER THE ENERGY RANGE

FROM 6 TO 100 KEV WITH AN ATMOSPHERIC X RAY IMAGING SPECTROMETER. THE DATA FROM THESE INSTRUMENTS ARE USED AS INPUT TO COMPUTATIONAL MODELS.

----- UARS-1, ZUREK -----

INVESTIGATION NAME- RADIATIVE-DYNAMIC BALANCES IN THE MESOSPHERE

NSSDC ID- UARS-1 -23

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - R.W. ZUREK

NASA-JPL

BRIEF DESCRIPTION

THE OVERALL OBJECTIVE OF THIS INVESTIGATION IS TO CONSTRUCT A COMPREHENSIVE AND CONSISTENT CLIMATOLOGY OF THE MESOSPHERE AS OBSERVED BY THE UARS SATELLITES. FROM THE MESOSPHERIC DATA, THIS ANALYSIS PRODUCES: (1) THE RADIATIVE BUDGET BASED ON O3 AND O2 ABSORPTION OF SOLAR RADIANCE AND CO2 EMISSION, INCLUDING THE EFFECTS ON THE LATTER OF NON-THERMODYNAMIC EQUILIBRIUMS; AND (2) THE DYNAMICAL CLIMATOLOGY OF THE MESOSPHERE, SHOWING THE RELATIVE CONTRIBUTIONS TO THE HEAT AND MOMENTUM BUDGETS BY ADIABATIC HEATING, BY THE MEAN MERIDIONAL CIRCULATION, AND BY EDDIES (WAVES). THE EDDY CONTRIBUTION IS SEPARATED INTO STANDING AND TRANSIENT COMPONENTS WHICH INCLUDE DYNAMICAL FLUXES DUE TO ATMOSPHERIC TIDES.

\*\*\*\*\* UARS-2\*\*\*\*\*

SPACECRAFT COMMON NAME- UARS-2  
ALTERNATE NAMES- UPPER ATMOSPHERIC RESEARCH SAT

NSSDC ID- UARS-2

LAUNCH DATE- 10/00/87  
LAUNCH SITE- VANDENBERG AFB, UNITED STATES  
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY  
UNITED STATES NASA-GA

PLANNED ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC  
ORBIT PERIOD- 97. MIN  
PERIAPSIS- 600. KM ALT

INCLINATION- 70. DEG  
APOAPSIS- 600. KM ALT

PERSONNEL

MG - R.J. ARNOLD

NASA HEADQUARTERS

SC - R.K. SEALS

NASA HEADQUARTERS

PM - P.T. BURR

NASA-GSFC

PS - C.A. REBER

NASA-GSFC

BRIEF DESCRIPTION

TWO UPPER ATMOSPHERE RESEARCH SATELLITES, UARS-1 AND UARS-2 WILL BE LAUNCHED AS PART OF THE UPPER ATMOSPHERE RESEARCH PROGRAM. THE BASIC OBJECTIVES OF THE UARS-2 MISSION ARE TO CONDUCT RESEARCH IN THE ATMOSPHERE ABOVE THE TROPOPAUSE, AND TO MEASURE THE GLOBAL BUDGET OF CONSTITUENT TRACE GASES AND THEIR CHEMICAL, DYNAMICAL, AND RADIATIVE BEHAVIOR. SPECIFICALLY THE OBJECTIVES ARE TO: (1) STUDY ENERGY INPUT AND LOSS IN THE UPPER ATMOSPHERE; (2) STUDY GLOBAL ATMOSPHERIC PHOTOCHEMISTRY; (3) STUDY UPPER ATMOSPHERE DYNAMICS; AND (4) STUDY THE COUPLING AMONG PROCESSES AND BETWEEN ATMOSPHERIC REGIONS. UARS-2 WILL BE LAUNCHED 1 YEAR AFTER UARS-1 INTO A SIMILAR 600-KM CIRCULAR ORBIT BUT WITH A HIGHER INCLINATION ANGLE. THE PLANNED LIFETIME FOR EACH SPACECRAFT IS 18 MONTHS, BUT THIS MAY BE EXTENDED BY RETRIEVAL OR IN-ORBIT REFURBISHMENT/RESUPPLY BY THE SHUTTLE. THE UARS HAS TWO MAJOR COMPONENTS. THE FIRST IS THE MULTIMISSION MODULAR SPACECRAFT (MMS), DESIGNED AS A STANDARD BUS FOR THE NASA SPACECRAFT MISSIONS (E.G., SHM AND LANDSAT-4), AND CONSISTING OF FOUR BASIC MODULES: ATTITUDE CONTROL SUBSYSTEM; POWER SUBSYSTEM; COMMUNICATIONS AND DATA HANDLING SUBSYSTEMS AND THE PROPULSION MODULE. THE SECOND MAJOR COMPONENT IS AN INSTRUMENT ASSEMBLY (IA) WHICH IS COMPOSED OF THE FOLLOWING INSTRUMENT MODULES: (1) THE FOUR MICROWAVE ANTENNAS AND THEIR MOMENTUM-COMPENSATING DEVICES; (2) A SOLAR-POINTED INSTRUMENT PLATFORM WITH SOLAR INSTRUMENTS; (3) THE CRYOGENIC LIMB INTERFEROMETER INSTRUMENTS; (4) A MODULE COMPRISED OF SMALLER INSTRUMENTS THAT DO NOT REQUIRE CRYOGENIC COOLINGS; AND (5) A MODULE COMPRISED OF SMALLER INSTRUMENTS THAT DO CONTAIN CRYOGENS. THE MMS WILL MAINTAIN A PRECISE ORIENTATION TO THE LOCAL VERTICAL AND TO THE VELOCITY VECTOR. THERE ARE THREE ON-BOARD TAPE RECORDERS. THREE NASA STANDARD 50-AMP HOURS NICKEL-CADMIUM BATTERIES WILL FLY ALONG WITH THE SOLAR CELL ARRAY. THE DATA WILL BE RETURNED TO EARTH BY TDSS. A CENTRAL DATA PROCESSING FACILITY WITH REMOTE PROCESSING AND DISPLAY TERMINALS AT THE INVESTIGATORS' INSTITUTION IS PLANNED.

----- UARS-2, BRUECKNER -----

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR 120-400 NM

NSSDC ID- UARS-2 -08

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
SOLAR PHYSICS

PERSONNEL

PI - G.E. BRUECKNER  
OI - R.E. VAN HOOSIER  
OI - D.R. PRINZ  
OI - J.D.F. BARTOE

US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB  
US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

THE MAIN OBJECTIVE OF THIS INVESTIGATION IS TO IMPROVE THE EXISTING ACCURACY OF SOLAR FLUX MEASUREMENTS IN THE 120- TO 400-NM REGION OF THE SPECTRUM AND TO ESTABLISH THE VARIATIONS OF THIS FLUX OVER A SOLAR CYCLE. THE FULL-SUN SPECTRAL IRRADIANCE IS MEASURED WITH TWO SPECTRAL RESOLUTIONS, 0.15 AND 5 NM, WITH AN ABSOLUTE ACCURACY OF PLUS OR MINUS 6-10 PERCENT (WAVELENGTH DEPENDENT). THE ACCURACY OF THE MEASUREMENTS BELOW 210 NM RELATIVE TO MEASUREMENTS OF THE MORE STABLE SOLAR CONTINUUM ABOVE 210 NM IS PLUS OR MINUS 1-5 PERCENT (WAVELENGTH DEPENDENT). THE SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR (SUSIM) CONSISTS OF TWO IDENTICAL DOUBLE DISPERSION SCANNING SPECTROMETERS, SEVEN DETECTORS, AND A DEUTERIUM CALIBRATION LAMP. THE SPECTROMETERS AND DETECTORS ARE SEALED IN A CANISTER FILLED WITH 1.1 ATM OF ARGON GAS. ONE SPECTROMETER IS USED ALMOST CONTINUOUSLY; THE SECOND IS USED INFREQUENTLY TO TRACK THE STABILITY OF THE FIRST. THE DEUTERIUM LAMP SERVES AS A SECONDARY STANDARD FOR IN-FLIGHT CALIBRATION.

----- UARS-2, CARLSON -----

INVESTIGATION NAME- GLIMPSE:GLOBAL LIMB PHOTOMETRIC SCANNING EXPERIMENT

NSSDC ID- UARS-2 -14

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - R.W. CARLSON  
OI - A.L. FYRAT  
OI - E.R. REITER  
OI - V.L. YUNG  
OI - J.E. LOVILL

NASA-JPL  
NASA-JPL  
COLORADO STATE U  
CALIF INST OF TECH  
LAWRENCE LIVERMORE LAB

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO PRODUCE DAILY GLOBAL MAPS OF VERTICAL OZONE PROFILES IN THE 10- TO 50-KM RANGE, AT 3-KM VERTICAL RESOLUTION AND 500 BY 500 KM HORIZONTAL RESOLUTION WITH 5 PERCENT PRECISION. THE PROFILES ARE OBTAINED BY LIMB SCANS OF THE ATMOSPHERIC RADIANCE, UTILIZING ABSORPTION IN THE VISIBLE CHAPPUIS AND NEAR-UV HARTLEY BANDS TO DETERMINE OZONE ABUNDANCES. THE MEASUREMENTS ARE "INVERTED" TO GIVE OZONE PROFILES IN THE NEAR-REAL TIME USING A HIGH-SPEED ARRAY PROCESSOR. THE INSTRUMENT CONSISTS OF AN EIGHT-CHANNEL LIMB SCANNING PHOTOMETER TO PROVIDE LIMB RADIANCE PROFILES AND A FOUR-CHANNEL DOWN-LOOKING GROUND/CLOUD ALBEDO SENSOR TO PROVIDE BOUNDARY CONDITIONS FOR THE DATA INVERSION. FOR THE LIMB SCAN PHOTOMETER, THE WAVELENGTH CHANNELS ARE (IN ANGSTROMS): 3000, 3200, 3500, 3800, 4100, 4400, 4700, AND 5000; THE SPECTRAL BANDPASSES ARE 50-250 Å, DEPENDING ON CHANNEL; AND LIMB SCAN TIME IS 2.0 S. THE PROJECTED FIELD OF VIEW IS 1 KM DIAMETER. FOR THE GROUND/CLOUD ALBEDO PHOTOMETER, THE WAVELENGTH CHANNELS ARE (IN ANGSTROMS) 3200, 3500, 4000, AND 7000. SPECTRAL BAND PASSES ARE 100 Å, AND THE SCAN TIME IS 12 S. THE PROJECTED FIELD OF VIEW IS 50-80 KM.

----- UARS-2, CHANG -----

INVESTIGATION NAME- THEORETICAL ANALYSIS-CHEMICAL, RADIATIVE, AND DYNAMICAL PROCESSES-MIDDLE ATMOSPHERE

NSSDC ID- UARS-2 -24

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - J.S. CHANG  
PI - F.M. LUTHER  
OI - W.H. DUEWER  
OI - J.E. FENNER  
OI - D.J. WUEBBLES

LAWRENCE LIVERMORE LAB  
LAWRENCE LIVERMORE LAB  
LAWRENCE LIVERMORE LAB  
LAWRENCE LIVERMORE LAB  
LAWRENCE LIVERMORE LAB

**BRIEF DESCRIPTION:**  
THIS INVESTIGATION STUDIES THE MECHANISMS THAT CONTROL UPPER ATMOSPHERE STRUCTURE VARIABILITY AND THE RESPONSE OF THE UPPER ATMOSPHERE TO NATURAL AND ANTHROPOGENIC PERTURBATIONS. THE FOCUS IS ON THE CHEMICAL, RADIATIVE, AND DYNAMICAL PROCESSES IN THE MIDDLE ATMOSPHERE USING TIME-DEPENDENT TRANSPORT-KINETICS MODELS.

----- UARS-2, GELLER -----

INVESTIGATION NAME- OBSERVATION-THEORETICAL MODELLING INVESTIGATIONS OF DYNAMICS FOR UARS

NSSDC ID- UARS-2-20 INVESTIGATIVE PROGRAM CODE ED

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - M.A. GELLER	U OF MIAMI
OI - E.J. PITCHER	U OF MIAMI
OI - J.E. GEISLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE MAJOR GOALS OF THIS INVESTIGATION ARE: (1) TO CONSTRUCT A SIMULATION OF UPPER ATMOSPHERE FLOW REGIMES AND UTILIZE THE PROPOSED UARS OBSERVING PARAMETERS TO STUDY THE RESOLVABILITY OF UPPER ATMOSPHERE DYNAMICS BY THE UARS INSTRUMENTS AND SUBSEQUENT DATA ANALYSIS; (2) TO USE PRE-UARS LIMB SCANNING DATA FOR THE STRATOSPHERE AND MESOSPHERE FOR GENERAL CIRCULATION STUDIES; (3) TO ASSESS THE EXTENT TO WHICH UPPER ATMOSPHERE DATA MUST BE INCLUDED IN STUDIES OF TROPOSPHERIC CLIMATE AND IN EXTENDED RANGE FORECASTINGS; AND (4) TO PURSUE A THEORETICAL MODELING EFFORT ON STRATOSPHERIC/MESOSPHERIC DYNAMICS AND ITS RELATION TO TROPOSPHERIC DYNAMICS.

----- UARS-2, GILLE -----

INVESTIGATION NAME- ADVANCED LIMB SCANNER

NSSDC ID- UARS-2-10 INVESTIGATIVE PROGRAM CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.C. GILLE	NATL CTR FOR ATROS RES
PI - J.M. RUSSELL, SRD	NASA-LARC
OI - R.J. CICERONE	U OF CALIF, SAN DIEGO
OI - P.J. CRUTZEN	NATL CTR FOR ATROS RES
OI - M.A. GELLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE ADVANCED LIMB SCANNER (ALS) EXPERIMENT HAS AS ITS OBJECTIVE MEASUREMENT OF THE VERTICAL AND HORIZONTAL DISTRIBUTIONS OF IMPORTANT TRACE GASES IN THE UPPER ATMOSPHERE, INCLUDING O<sub>3</sub>, N<sub>2</sub>O, N<sub>2</sub>O<sub>5</sub>, N<sub>2</sub>O<sub>4</sub>, H<sub>2</sub>O, AND CH<sub>4</sub>, AND TEMPERATURE MEASUREMENT IN THE 8- TO 75-KM ALTITUDE RANGE WITH A 1 DEG K RMS ERROR FOR ALTITUDE LESS THAN 50 KM. A MULTISPECTRAL INTERFERENCE FILTER RADIOMETER WITH ELEVATION SCAN AND TWO-AZIMUTH POSITION CAPABILITY IS USED AND THE MEASUREMENT TECHNIQUE INVOLVES THE INVERSION OF THE MEASURED RADIANCE PROFILES. INSTANTANEOUS VERTICAL FIELDS OF VIEW (IFOV) ARE LESS THAN 2 KM IN ALL EXCEPT TWO CHANNELS WHICH ARE DESIGNED FOR LOW ALTITUDE SENSING. FOR THESE CHANNELS THE IFOV IS LESS THAN 1 KM. THE SPECTRAL RANGE OF APPROXIMATELY 6 TO 18 MICRONS IS COVERED WITH CHANNELS RANGING IN RESOLUTION FROM 60 TO 220 INVERSE CENTIMETER. THE INSTRUMENT USES MERCURY-CADMIUM-TELLURIUM DETECTORS COOLED TO 80 DEG K.

----- UARS-2, GILLE -----

INVESTIGATION NAME- CRYOGENIC UPPER-ATMOSPHERE LIMB EMISSION RADIOMETER

NSSDC ID- UARS-2-12 INVESTIGATIVE PROGRAM CODE ED

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.C. GILLE	NATL CTR FOR ATROS RES
PI - U.G. MANKIN	NATL CTR FOR ATROS RES
PI - R.G. ROBLE	NATL CTR FOR ATROS RES
OI - P.J. CRUTZEN	NATL CTR FOR ATROS RES
OI - M.T. COFFEY	NATL CTR FOR ATROS RES
OI - J.R. HOLTON	U OF WASHINGTON
OI - V.G. KUNDE	NASA-GFRC
OI - D.G. MURRAY	U OF DENVER
OI - J.M. RUSSELL, SRD	NASA-LARC
OI - A.T. STAIR, JR.	USAF GEOPHYS LAB
OI - M.A. GELLER	U OF MIAMI

**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVE IS TO OBTAIN MEASUREMENTS, THE INVERSION OF WHICH PROVIDED MORE DETAILED AND COMPREHENSIVE GLOBAL MAPS OF TEMPERATURE, TRACE SPECIES, AND EMISSION FEATURES OVER THE 10- TO 120-KM RANGE. THE CRYOGENIC UPPER ATMOSPHERE LIMB EMISSION RADIOMETER (CULER) IS A CRYOGENICALLY COOLED TELESCOPE OF 19-CM APERTURE WITH A LIMB SCANNING MIRROR FEEDING A 24-CHANNEL RADIOMETER AND A CIRCULAR VARIABLE FILTER (CVF) SPECTROMETER. THE FIXED RADIOMETRIC CHANNELS, SELECTED BY GRATING-FILTER COMBINATIONS BETWEEN 370-7000 INVERSE CENTIMETER (1.9 TO 27 MICRONS), ARE TAILORED FOR SPECIFIC MEASUREMENTS (E.G., TEMPERATURE SOUNDINGS, CONCENTRATION OF PREDETERMINED CHEMICAL SPECIES, OR EMISSIONS FROM SPECIFIC EXCITATION MECHANISMS). THE SPECTRALLY SELECTIVE CVF HAS 1 PERCENT RESOLUTION BETWEEN 660-9000 INVERSE CENTIMETER.

----- UARS-2, GRAYSTONE -----

INVESTIGATION NAME- THEORETICAL INVESTIGATION PHYSICS, CHEMISTRY, AND DYNAMICS-STRATOSPHERE

NSSDC ID- UARS-2-25 INVESTIGATIVE PROGRAM

CODE ED/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - P. GRAYSTONE

METEOROLOGICAL OFFICE

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THIS INVESTIGATION ARE TO FURTHER THE UNDERSTANDING OF THE STRATOSPHERE AND TO STUDY ITS INTERACTIONS WITH THE TROPOSPHERE. THESE OBJECTIVES ARE ACHIEVED THROUGH TWO PRIMARY ACTIVITIES, ANALYSIS AND DIAGNOSIS. A COMPREHENSIVE THREE DIMENSIONAL NUMERICAL MODEL OF THE TROPOSPHERE AND STRATOSPHERE IS USED.

----- UARS-2, GROSSE -----

INVESTIGATION NAME- STRATOSPHERIC TRANSPORT PROCESSES/BUDGET OF MINOR CONSTITUENTS-AND ENERGETICS

NSSDC ID- UARS-2-22 INVESTIGATIVE PROGRAM

CODE ED

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - W.L. GROSSE	NASA-LARC
OI - W.T. BLACKSHEAR	NASA-LARC
OI - R.V. HAGGARD	NASA-LARC
OI - E.E. REMSDERG	NASA-LARC
OI - R.E. TURNER	NASA-LARC
OI - R.J. KURZEJA	GEORGE WASHINGTON U

**BRIEF DESCRIPTION**

THIS INVESTIGATION IS A COORDINATED PROGRAM OF THEORETICAL MODEL STUDIES AND DATA ANALYSIS, AND INTERPRETATION DESIGNED TO STUDY TRANSPORT PROCESSES, BUDGETS OF TRACE CHEMICALS, AND ENERGETICS OF THE STRATOSPHERE. THE FIRST PART OF THIS EFFORT IS DEVOTED TO THE STUDY OF THE TRANSPORT OF MINOR CONSTITUENTS, HEAT, MOMENTUM, AND POTENTIAL VORTICITY IN THE STRATOSPHERE. THE SECOND PART UTILIZES UARS DATA TO STUDY BUDGETS OF TRACE CHEMICALS BY DETERMINING BULK MASS TRANSFER RATES WITHIN THE STRATOSPHERE AND AMONG THE STRATOSPHERE, TROPOSPHERE, AND MESOSPHERE. THE LAST PART OF THIS EFFORT IS AN ANALYSIS OF THE STRATOSPHERE ENERGETICS.

----- UARS-2, MAYS -----

INVESTIGATION NAME- HIGH RESOLUTION DOPPLER IMAGER (HRDI)

NSSDC ID- UARS-2-02 INVESTIGATIVE PROGRAM

CODE ED/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - P.B. MAYS	U OF MICHIGAN
OI - S. HERNANDEZ	NOAA-ERL
OI - S. REES	U COLLEGE LONDON
OI - R.G. ROBLE	NATL CTR FOR ATROS RES

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IT TO USE A HIGH SOLUTION DOPPLER IMAGING FABRY-PEROT INTERFEROMETER DETECTING SHARP FEATURES IN THE SPECTRUM OF LIGHT EMITTED OR SCATTERED FROM THE EARTH'S ATMOSPHERE TO OBTAIN THE TEMPERATURE AND VECTOR WIND FIELD DIRECTLY. THE INFORMATION OBTAINED WILL BE USED TO STUDY A SERIES OF PROBLEMS ASSOCIATED WITH THE DYNAMICS OF THE ATMOSPHERE AND THE TRANSPORT OF MINOR CONSTITUENTS WITHIN THE ATMOSPHERE. THERE IS A SINGLE SENSOR CONTAINING THE SPECTRAL FILTERS AND THE MAIN OBJECTIVE TELESCOPE WHICH CAN VIEW THE EARTH'S HORIZON THROUGH EITHER OF TWO ORTHOGONAL BAFFLE SYSTEMS. SWITCHING BETWEEN THESE BAFFLES IS

ACCOMPLISHED BY ROTATING THE ZENITH BEAM MIRROR THROUGH 90 DEG. HORIZON SCANNING IS ACCOMPLISHED BY TILTING THIS MIRROR THROUGH 7.5 DEG IN THE ZENITH DIRECTION.

----- UARS-2, MEELIS -----

INVESTIGATION NAME- ION CONVECTION ELECTRODYNAMICS

NSSDC ID- UARS-2 -06

INVESTIGATIVE PROGRAM  
CODE ED

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
IONOSPHERES  
PLANETARY ATMOSPHERES  
ATMOSPHERIC PHYSICS

PERSONNEL

PI - R.A. MEELIS	U OF TEXAS, DALLAS
OI - W.B. HANSON	U OF TEXAS, DALLAS
OI - J.H. HOFFMAN	U OF TEXAS, DALLAS
OI - C.R. LIPPENCOTT	U OF TEXAS, DALLAS
OI - R.G. ROBLE	NASA CTR FOR ATOMS RES
OI - E.L. BREIS	U OF TEXAS, DALLAS
OI - D.W. ZUCCHI	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

THE OBJECTIVES OF THIS INVESTIGATION ARE: (1) TO MEASURE THE ION VELOCITY FIELD ALONG THE ORBIT TRACK, FROM WHICH THE CORRESPONDING IONOSPHERIC ELECTRIC FIELDS MAY BE DERIVED; (2) TO USE THE DERIVED ELECTRIC FIELDS, TOGETHER WITH WIND, PARTICLE FLUX, AND MAGNETIC FIELD DATA, TO CONSTRUCT MODELS OF THE HIGH LATITUDE POTENTIAL DISTRIBUTION AND HEAT INPUT FROM BOTH PARTICLE AND JOULE HEATING; (3) TO USE THE MODEL HEATING AND ION-NEUTRAL MOMENTUM TRANSFER AS INPUTS TO GLOBAL MODELS OF ATMOSPHERIC CHEMISTRY AND DYNAMICS; AND (4) TO USE THE DERIVED GLOBAL ELECTRIC FIELD DISTRIBUTIONS TO CONSTRUCT MODELS THAT WILL REVEAL THE INTERPLAY BETWEEN THE SOLAR WIND, THUNDERSTORM ACTIVITY, AND IONOSPHERIC ELECTRIC FIELDS. THE ION CONVECTION ELECTRODYNAMICS (ICE) INSTRUMENT MAKES THE FOLLOWING MEASUREMENTS: (1) BULK ION VELOCITY (ALL COMPONENTS ARE MEASURED TO 5 PERCENT, THE SENSITIVITY IS 10 m/sec FOR THE RAM COMPONENT AND 2 m/s FOR THE HORIZONTAL AND VERTICAL COMPONENTS. THE SAMPLING DISTANCES FOR THE RAM, HORIZONTAL, AND VERTICAL COMPONENTS ARE LESS THAN 8 KM, APPROXIMATELY 250 m, AND 500 m, RESPECTIVELY); (2) THE ION TEMPERATURE (MEASURED IN THE RANGE 200 TO 20,000 DEG K WITH AN ACCURACY OF PLUS OR MINUS 3 PERCENT, AND AT A SAMPLING DISTANCE OF LESS THAN 8 KM); (3) ION CONCENTRATIONS (MEASURED OVER THE RANGE 10 TO 1.0E+6 PER CUBIC CM WITH AN ACCURACY OF PLUS OR MINUS 3 PERCENT, AT A SAMPLING DISTANCE OF ABOUT 500 m); (4) ELECTRON TEMPERATURE (MEASURED OVER THE RANGE FROM 300 TO 20,000 DEG K, WITH AN ACCURACY OF PLUS OR MINUS 10 PERCENT AND AT A SAMPLING DISTANCE OF LESS THAN 80 KM).

----- UARS-2, HOLTON -----

INVESTIGATION NAME- WAVE DYNAMICS AND TRANSPORT IN THE MIDDLE ATMOSPHERE

NSSDC ID- UARS-2 -17

INVESTIGATIVE PROGRAM  
CODE EH

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.R. HOLTON	U OF WASHINGTON
OI - J.M. WALLACE	U OF WASHINGTON
OI - D.L. HARTMANN	U OF WASHINGTON
OI - R.E. YOUNG	NASA-ARC
OI - C.B. LEVY	U OF WASHINGTON

BRIEF DESCRIPTION

THIS INVESTIGATION USES A PROGRAM OF OBSERVATIONAL ANALYSIS AND NUMERICAL MODELING DESIGNED TO ELUCIDATE THE NATURE OF THE GENERAL CIRCULATION OF THE MIDDLE ATMOSPHERE, THE ROLE OF DYNAMICS IN CONTROLLING THE DISTRIBUTION AND VARIABILITY OF VARIOUS TRACE CONSTITUENTS, AND THE NATURE AND EXTENT OF DYNAMICAL INTERACTIONS BETWEEN THE LOWER AND MIDDLE ATMOSPHERES. EMPHASIS IS PLACED ON THE ROLES WHICH LARGE-SCALE WAVE MOTIONS PLAY IN MAINTAINING THE BUDGETS OF MOMENTUM, HEAT, AND TRACE CONSTITUENT CONCENTRATIONS ON A GLOBAL BASIS IN THE MIDDLE ATMOSPHERE.

----- UARS-2, HOUGHTON -----

INVESTIGATION NAME- AN IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER (ISAMS)

NSSDC ID- UARS-2 -11

INVESTIGATIVE PROGRAM  
CODE EH/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.T. HOUGHTON	OXFORD U
OI - R. HUNNEMAN	READING U
OI - M. HABLEY	RUTHERFORD HIGH LN LAB
OI - R.H. DAVIES	RUTHERFORD HIGH BN LAB
OI - G.D. PESKETT	OXFORD U
OI - C.D. RODGERS	OXFORD U
OI - E.J. WILLIAMSON	OXFORD U
OI - J.J. BARNETT	OXFORD U
OI - J.G. WHITNEY	OXFORD U
OI - C.A. BAILEY	OXFORD U
OI - G.R. THORNTON	OXFORD U
OI - J.S. SEELEY	READING U

BRIEF DESCRIPTION

THE INVESTIGATION OBJECTIVE IS TO MAKE GLOBAL MEASUREMENTS OF RADIATION FROM CO<sub>2</sub>, H<sub>2</sub>O, CO, NO, NO<sub>2</sub>, AND CH<sub>4</sub>. THESE MEASUREMENTS YIELD: THE KINETIC TEMPERATURE, VIBRATIONAL TEMPERATURE, AND ALTITUDE DISTRIBUTION FOR CO<sub>2</sub>; (2) THE H<sub>2</sub>O CONCENTRATION (FROM 15 TO 110 KM); (3) THE CO ALTITUDE DISTRIBUTION; (4) THE NO ALTITUDE DISTRIBUTION; (5) THE NO<sub>2</sub> ALTITUDE DISTRIBUTION; AND (6) THE CH<sub>4</sub> ALTITUDE DISTRIBUTION. THESE PARAMETERS ARE OBTAINED AS A FUNCTION OF TIME AND LOCATION. THE IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER IS AN INFRARED RADIOMETER OBSERVING THERMAL EMISSION AND RESONANCE FLUORESCENCE OF SOLAR RADIATION FROM THE ATMOSPHERIC LIMB BY GAS CORRELATION SPECTROSCOPY. THE SPECTRAL RANGE COVERED IS 2.7 TO 100 MICRONS. THE ALTITUDE RANGE EXTENDS FROM 15 TO 140 KM, DEPENDING UPON THE PARTICULAR SPECIES MEASURED. FOR MOST CHANNELS, VERTICAL PROFILES OF TEMPERATURE (TO APPROXIMATELY 1 DEG K ACCURACY) AND COMPOSITION (TO APPROXIMATELY 10 PERCENT) CAN BE MADE WITH A VERTICAL RESOLUTION BETTER THAN 4 KM AND A HORIZONTAL RESOLUTION OF 400 KM (LIMITED BY GEOMETRY OF LIMB PATH).

----- UARS-2, LONDON -----

INVESTIGATION NAME- RESPONSE OF UPPER ATMOSPHERE PARAMETERS TO VARIATIONS OF SOLAR ACTIVITY

NSSDC ID- UARS-2 -19

INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - J. LONDON	U OF COLORADO
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BRIEF DESCRIPTION

THIS INVESTIGATION DEALS WITH THE NATURAL VARIABILITY OF THE THERMAL STRUCTURE AND OZONE CONCENTRATION OF THE UPPER ATMOSPHERE WITH EMPHASIS ON THEIR RESPONSE TO SIGNIFICANT SOLAR VARIABILITY. IT PROVIDES DEFINITIVE TESTS FOR ANALYSIS OF RETRIEVED DATA OF SPECIFIED MECHANISMS BY WHICH OZONE VARIATIONS ARE IN RESPONSE TO VARIATIONS IN SOLAR ACTIVITY. A TWO-FOLD APPROACH IS USED: DATA ANALYSIS AND STATISTICAL EVALUATION OF THE PERTINENT UPPER ATMOSPHERE PARAMETERS AS THEY RELATE TO VARIOUS FORMS OF SOLAR ACTIVITY; AND THEORETICAL STUDY OF THE SENSITIVITY OF REALISTIC MODELS OF THE OZONE PHOTOCHEMICAL EQUILIBRIUM SYSTEM AS RELATED TO OBSERVED AND SUGGESTED SOLAR VARIABILITY.

----- UARS-2, MILLER -----

INVESTIGATION NAME- SYNOPTIC ANALYSIS-DYNAMICAL INTERPRETATION OF UARS METEOROLOGICAL INFORMATION

NSSDC ID- UARS-2 -16

INVESTIGATIVE PROGRAM  
CODE ER

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J. MILLER	NOAA-NMC
PI - R.S. QUIROZ	NOAA-NMC

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO MERGE TEMPERATURE AND WIND MEASUREMENTS IN THE STRATOSPHERE AND MESOSPHERE WITH THE OPERATIONAL NATIONAL WEATHER SERVICE ANALYSES. ENERGY BUDGET TERMS ARE EVALUATED AND HEIGHT AND TEMPERATURE FIELDS (PLANETARY WAVES) ARE ANALYZED BY FOURIER ANALYSIS. THE INTERLAYER DYNAMIC COUPLING AMONG THE TROPOSPHERE, STRATOSPHERE, AND MESOSPHERE ALSO IS STUDIED.

----- UARS-2, MOUNT -----

INVESTIGATION NAME- ULTRAVIOLET OZONE SPECTROMETER

NSSDC ID- UARS-2 -03

INVESTIGATIVE PROGRAM  
CODE EH

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - G.H. MOUNT  
OI - C.A. BARTH  
OI - C.W. MORR  
OI - D.W. RUSCH

U OF COLORADO  
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U OF COLORADO  
U OF COLORADO

**BRIEF DESCRIPTION**

THE OBJECTIVES OF THIS INVESTIGATION ARE TO MEASURE THE OZONE DENSITY IN THE ALTITUDE RANGE FROM 40 TO 90 KM, BY OBSERVING THE ATTENUATION OF RAYLEIGH SCATTERED SUNLIGHT IN THE NEAR ULTRAVIOLET AT WAVELENGTHS FROM 2400 TO 3400 Å, AND TO DETERMINE THE NITRIC OXIDE (NO<sub>x</sub>) DENSITY IN THE ALTITUDE RANGE FROM 80 TO 250 KM, BY OBSERVING THE SUNLIGHT FLUORESCENTLY SCATTERED IN THE NO GAMMA BANDS AT 2100 TO 2900 Å. THE FLIGHT INSTRUMENT WILL BE A 280-MM FOCAL LENGTH, OFF-AXIS, PARABOLIC TELESCOPE AND DUAL CHANNEL 1/8-P. ENERGY-PASTIE SPECTROGRAPH EMPLOYING TWO PHOTOMULTIPLIER TUBES OPERATING IN THE SPECTRAL RANGES 2100-3100 Å AND 2400-3400 Å AT 20-Å RESOLUTION. THE INSTRUMENT IS MOUNTED ONTO A SCAN PLATFORM, ALLOWING SCANNING OF THE EARTH'S LIMB IN 3-KM HEIGHT INCREMENTS IN A TIME PERIOD OF 12 S. OPERATING MODES INCLUDE: (1) SIMULTANEOUS INTENSITY MEASUREMENTS AT TWO WAVELENGTHS SEPARATED BY APPROXIMATELY 300 Å, ONE WHERE THE OZONE ABSORPTION IS STRONG AND ONE WHERE IT IS WEAK AS THE SCAN PLATFORM SCANS THE EARTH'S LIMB; AND (2) MEASUREMENT OF THE GAMMA BANDS IN THE RANGE 2150 TO 2450 Å AS THE INSTRUMENT IS SCANNED THROUGH THE EARTH'S LIMB.

----- UARS-2, POTENZA-----  
**INVESTIGATION NAME-** MAGNETOMETER EXPERIMENT

NSSDC ID- UARS-2 -26

INVESTIGATIVE PROGRAM

CODE ED

INVESTIGATION DISCIPLINE(S)  
PLANETARY ATMOSPHERES  
IONOSPHERES  
PARTICLES AND FIELDS

**PERSONNEL**

PI - T.A. POTENZA  
OI - M. SUGIURA

APPLIED PHYSICS LAB  
NASA-GSFC

**BRIEF DESCRIPTION**

THE PRIMARY OBJECTIVE OF THIS INVESTIGATION IS TO MONITOR AND INVESTIGATE LARGE-SCALE, FIELD-ALIGNED CURRENTS THAT ARE AN IMPORTANT ELEMENT IN THE COUPLING PROCESSES OF THE SOLAR WIND-MAGNETOSPHERE-IONOSPHERE-ATMOSPHERE SYSTEM. THE INSTRUMENT IS A TRIAXIAL PLUGATE MAGNETOMETER WITH A TOTAL RANGE OF PLUS OR MINUS 60,000 NT MEASURING THE VECTOR MAGNETIC FIELD AT THE RATE OF 16 TIMES PER S WITH A RESOLUTION OF 7.7 NT. THE INSTRUMENT IS BOOM MOUNTED.

----- UARS-2, REBER-----  
**INVESTIGATION NAME-** ANALYTIC-EMPIRICAL MODELING OF UPPER ATMOSPHERE PARAMETERS

NSSDC ID- UARS-2 -21

INVESTIGATIVE PROGRAM

CODE EP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

**PERSONNEL**

PI - C.A. REBER  
OI - F.T. HUANG  
OI - A.E. MEDIN  
OI - J.E. FREDERICK  
OI - J. LONDON  
OI - E. HILSENTHATH

NASA-GSFC  
COMPUTER SCIENCES CORP  
NASA-GSFC  
NASA-GSFC  
U OF COLORADO  
NASA-GSFC

**BRIEF DESCRIPTION**

THE PRIMARY OBJECTIVES OF THIS INVESTIGATION ARE THE ORGANIZATION, EMPIRICAL MODELING, AND GEOPHYSICAL INTERPRETATION OF THE VARIOUS DATA ACQUIRED FROM THE UARS. A SECONDARY OBJECTIVE IS THE ACQUISITION OF COMPLEMENTARY DATA FROM OTHER SOURCES (E.G., THE OPERATIONAL NOAA SATELLITES) FOR USE IN THIS ANALYSIS AND FOR USE BY THE UARS SCIENCE TEAM. A SUBSTANTIAL PART OF THE INVESTIGATION IS THE CALCULATION OF A TIME-DEPENDENT THREE-DIMENSIONAL ANALYTIC-EMPIRICAL MODEL USING DATA ON ATMOSPHERIC TEMPERATURE, MINOR SPECIES MIXING RATIOS, ETC. THE MODELING TECHNIQUE IS A DIRECT FOLLOW-UP TO THE '60 MUFL' AND THE 'MASS SPECTROMETER-INCOHERENT SCATTER (MSIS)' MODEL WHICH HAVE PROVEN QUITE SUCCESSFUL FOR THERMOSPHERIC RESEARCH, AND TO THE CURRENT EMPIRICAL OZONE MODELS, ALL OF WHICH WERE DEVELOPED AND ARE AVAILABLE AT THE GODDARD SPACE FLIGHT CENTER, CODE 490, GREENBELT, MD 20771.

----- UARS-2, ROCHE-----  
**INVESTIGATION NAME-** ALTITUDE DISTRIBUTION OF ATMOSPHERIC MINOR SPECIES AND TEMP. IN 10-60KM RANGE

NSSDC ID- UARS-2 -04

INVESTIGATIVE PROGRAM

CODE ED

INVESTIGATION DISCIPLINE(S)  
METEOROLOGY  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES

**ORIGINAL PAGE IS  
OF POOR QUALITY**

**PERSONNEL**

PI - A.E. ROCHE  
OI - J.B. KUMER  
OI - P.D. SEARS  
OI - T.L. JAMES  
OI - L.R. PEGILL  
OI - K.D. BAKER  
OI - D.G. MURRAY  
OI - A. GOLDMAN

LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
LOCKHEED PALO ALTO  
UTAH STATE U  
UTAH STATE U  
U OF DENVER  
U OF DENVER

**BRIEF DESCRIPTION**

THE INVESTIGATION OBJECTIVES ARE TO REMOTELY MEASURE THE STRATOSPHERIC COMPOSITION (H<sub>2</sub>O, N<sub>2</sub>O, NO<sub>x</sub>, CL<sub>2</sub>, CLO<sub>x</sub>, NEL, O<sub>3</sub>, CO<sub>2</sub>, AND CH<sub>4</sub>) AND TEMPERATURE IN THE 10- TO 60-KM ALTITUDE RANGE. THE COMPOSITION AND TEMPERATURE ARE DETERMINED FROM MEASUREMENTS OF LINE EMISSION SPECTRA IN THE 3.5- TO 12-MICRUM INFRARED WAVELENGTH RANGE. THE NECESSARY HIGH SENSITIVITY, BACKGROUND FLUX DISCRIMINATION, AND SPECTRAL RESOLUTION ARE PROVIDED BY A CRYOGENICALLY COOLED SOLID ETALON SPECTROMETER USING A LINEAR DETECTOR ARRAY TO SIMULTANEOUSLY COVER THE 10- TO 60-KM RANGE WITH 2-KM RESOLUTION. THE SPECTRAL RESOLUTION IS 0.25 INVERSE CENTIMETER. THREE DAYS ARE REQUIRED TO ACHIEVE GLOBAL COVERAGE WITHIN THE 75 DEG LATITUDE FOR THE 70 DEG ORBIT.

----- UARS-2, ROTTRAN-----

**INVESTIGATION NAME-** ULTRAVIOLET SOLAR SPECTRAL IRRADIANCE EXPERIMENT

NSSDC ID- UARS-2 -04

INVESTIGATIVE PROGRAM

CODE ED

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
SOLAR PHYSICS

**PERSONNEL**

PI - G.J. ROTTRAN  
OI - J. LONDON

U OF COLORADO  
U OF COLORADO

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE THE SOLAR SPECTRUM AT WAVELENGTHS BETWEEN 120 AND 500 NM WITH AN ABSOLUTE ACCURACY BETTER THAN 10 PERCENT. TEMPORAL VARIATIONS OF THE SOLAR RADIATION ARE FOLLOWED TO WITHIN 1-2 PERCENT DURING THESE MISSIONS. THERE IS A 1/8-Å R. ENERGY-PASTIE SPECTROMETER WITH APPROXIMATELY 0.15-Å SPECTRAL RESOLUTION ON BOARD. IT HAS THREE SEPARATE DATA CHANNELS, EACH USING A PHOTOTUBE OPTIMIZED FOR DIFFERENT, BUT OVERLAPPING, PORTIONS OF THE INSTRUMENT SPECTRAL RANGE. SOLAR DATA ARE TAKEN ON A DAILY BASIS AND ANALYZED TO ESTABLISH CORRELATIONS OF THE SPECTRAL IRRADIANCE WITH SOLAR ROTATION AND WITH SOLAR ACTIVITY (10.7-CM FLUX LEVELS, SUNSPOT NUMBER, CALCIUM PLAGE, SOLAR FLARES, ETC.). THE NORMAL MODE OF OPERATION INVOLVES A 4-H DUTY CYCLE PER DAY. OF THIS TOTAL TIME, 1 H IS SPENT OBSERVING THE SUN AND THE REMAINDER OF THE TIME IS SPENT IN CALIBRATION ACTIVITIES. TEN TO 15 STARS ARE CHOSEN FOR THE CALIBRATION PROGRAM.

----- UARS-2, RUSSELL-----

**INVESTIGATION NAME-** HALOGEN OCCULTATION EXPERIMENT (HALOE)

NSSDC ID- UARS-2 -09

INVESTIGATIVE PROGRAM

CODE ED

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

**PERSONNEL**

PI - J.M. RUSSELL, SR  
OI - J. PARK  
OI - S.R. DRAYSON  
OI - P.J. KRATZEN  
OI - R.J. CIECHONE  
OI - P.L. MANST

NASA-LARC  
CULL OF WILLIAM + MARY  
U OF MICHIGAN  
WATE CTR FOR ATMS OFS  
U OF CALIF, SAN DIEGO  
ENVIRON PROTECT AGENCY

**BRIEF DESCRIPTION**

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE, USING SOLAR OCCULTATION TECHNIQUES, THE 'PLA' ATMOSPHERIC VERTICAL CONCENTRATION PROFILES OF H<sub>2</sub>O, O<sub>3</sub>, NEL, NO<sub>x</sub>, ERG, NH<sub>3</sub>, AND CO<sub>2</sub>. PRESSURE IN THE ALTITUDE RANGE FROM 10 TO 45 KM IS MEASURED. MEASUREMENTS ARE USED TO STUDY TRACE GAS SOURCES AND SINKS, AND UPPER ATMOSPHERE TRANSPORT, AND TO VALIDATE PHOTOCHEMICAL AND ATMOSPHERIC DYNAMICS MODELS. A FOUR-CHANNEL GAS FILTER CORRELATION RADIOMETER AND A FIVE-CHANNEL FILTER RADIOMETER MOUNTED ON A COMMON CHASSIS WITH AZIMUTH AND ELEVATION CAPABILITY ARE USED. THE GAS FILTER CORRELATION RADIOMETRY IS USED TO MEASURE THE NEL, NO<sub>x</sub>, CH<sub>4</sub>, NH<sub>3</sub>, AND CO<sub>2</sub>, AND BROAD BAND FILTER SPECTROSCOPY IS USED TO MEASURE H<sub>2</sub>O, O<sub>3</sub>, NH<sub>3</sub>, AND CO<sub>2</sub>. THE CO<sub>2</sub> DATA ARE USED TO OBTAIN THE ATMOSPHERIC PRESSURE PROFILE.

----- UARS-2, THUILLIER -----

INVESTIGATION NAME- TEMPERATURE AND WIND MEASUREMENT IN THE MESOSPHERE AND LOWER THERMOSPHERE

NSSDC ID- UARS-2 -01

INVESTIGATIVE PROGRAM  
CODE EB/CO-OP

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - G.	THUILLIER	CNRS-SA
OI - P.	CONNES	PARIS OBSERVATORY
OI - M.	TEITELBAUM	CNRS-SA
OI - M.L.	BUBBIN	CNET
OI - P.	BLUM	U OF BONN
OI - S.S.	CHANDRA	NASA-GSFC

BRIEF DESCRIPTION

THE INVESTIGATION OBJECTIVES ARE TO MEASURE SIMULTANEOUSLY THE WIND AND TEMPERATURE IN THE HIGH MESOSPHERE AND LOW THERMOSPHERE, AND TO DERIVE THE EDDY DIFFUSION COEFFICIENT USING A REMOTE SENSING METHOD. ABSOLUTE LINE INTENSITIES ARE ALSO MEASURED. THE FLIGHT INSTRUMENT IS COMPOSED OF TWO MAIN UNITS. THE UPPER PART CONSISTS OF A CASSEGRAIN-TYPE TELESCOPE. THE LOWER PART CONSISTS OF A FIELD-COMPENSATED MICHELSON INTERFEROMETER AND ASSOCIATED OPTICS, DETECTORS, LASER UNIT, ELECTROMECHANISMS, AND ELECTRONS. THE WAVELENGTHS MEASURED (IN ANGSTROMS) ARE: 5577, 6300, 7278, 7319, AND 7371. THE SPECTRAL SCANNING IS ACHIEVED BY A SMALL-ANGLE PRISM CHANGING THE OPTICAL PATH OF APPROXIMATELY 1 WAVELENGTH IN 16 STEPS. THE LIMB IS SCANNED IN STEPS FROM 400 TO 70 KM. THE FIELD OF VIEW IS 2 DEG IN A HORIZONTAL PLANE AND THE VERTICAL FIELD OF VIEW VARIES FROM 16 ARC-MIN IN THE THERMOSPHERE, TO 6 ARC-MIN FOR MESOSPHERIC OBSERVATIONS. THE DURATION OF A COMPLETE SCAN FOR A GIVEN LINE IS 1.6 S.

----- UARS-2, TORR -----

INVESTIGATION NAME- ULTRAVIOLET STRATOSPHERIC IMAGING SPECTROMETER

NSSDC ID- UARS-2 -15

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.G.	TORR	U OF MICHIGAN
OI - M.R.	TORR	U OF MICHIGAN
OI - T.M.	DONAHUE	U OF MICHIGAN
OI - A.F.	NAGY	U OF MICHIGAN
OI - E.R.	YOUNG	U OF MICHIGAN
OI - S.C.	LIU	NOAA
OI - R.J.	CICERONE	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

THE PRIMARY OBJECTIVE OF THIS INVESTIGATION IS TO MAKE HIGH RESOLUTION STUDIES OF TRACE CONSTITUENTS IN THE MIDDLE ATMOSPHERE. THE CONSTITUENTS ARE OBSERVED THROUGH ABSORPTION OF RAYLEIGH SCATTERED SUNLIGHT, RESONANCE FLUORESCENCE OF SUNLIGHT AT ULTRAVIOLET WAVELENGTHS, CHEMILUMINESCENCE, AND PARTICLE IMPACT EXCITATION. THE INVESTIGATION ALSO MONITORS PARTICLE PRECIPITATION FROM THE INCLUDED EMISSIONS AT 3914 AND 4278A. AN ECHELLE GRATING SPECTROGRAPH MEASURES THE CONCENTRATIONS OF THE TRACE CONSTITUENTS, O<sub>3</sub>, OH, ClO, NO, AND NO<sub>2</sub> AT STRATOSPHERIC AND MESOSPHERIC ALTITUDES. A HIGH-RESOLUTION (0.04A) ATLAS WILL BE COMPILED IN BOTH ABSORPTION AND EMISSION. THE WAVE LENGTH RANGE IS 2000 TO 4600A. THE IMAGING CAPABILITY PERMITS A 50-KM ALTITUDE PROFILE (E.G., 20 TO 70 KM) TO BE OBSERVED SIMULTANEOUSLY AT 5-KM RESOLUTION.

----- UARS-2, WATERS -----

INVESTIGATION NAME- MICROWAVE LIMB SOUNDER (MLS)

NSSDC ID- UARS-2 -15

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
PARTICLES AND FIELDS  
METEOROLOGY  
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.W.	WATERS	NASA-JPL
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BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO MEASURE WIND, O<sub>3</sub>, ClO, H<sub>2</sub>O<sub>2</sub>, TEMPERATURE, O<sub>2</sub>, CO, H<sub>2</sub>O, MAGNETIC FIELD, AND PRESSURE IN THE UPPER ATMOSPHERE. THE SPECTRAL REGION COVERED IS FROM 63 TO 231 GHZ. THE SAMPLED ALTITUDE RANGE EXTENDS FROM 15 TO 110 KM. THE INSTRUMENT HAS 2-5 INTEGRATION, WITH LONGER INTEGRATIONS PERFORMED AS APPROPRIATE DURING DATA REDUCTION. ABSOLUTE ACCURACY OF THIS MICROWAVE LIMB SOUNDER (MLS) IS APPROXIMATELY 5 PERCENT FOR COMPOSITION, APPROXIMATELY 2 DEG K

FOR TEMPERATURE, AND APPROXIMATELY 3 M/S FOR WINDS. VERTICAL RESOLUTION FOR PROFILE MEASUREMENTS IS 3-6 KM; HORIZONTAL RESOLUTION IS 30 KM ACROSS AND 300 KM ALONG THE OBSERVATION DIRECTION. COMPLETE PROFILES ARE OBTAINED IN LESS THAN 50 S.

----- UARS-2, WINNINGHAM -----

INVESTIGATION NAME- PARTICLE ENVIRONMENT MONITOR (PEM)

NSSDC ID- UARS-2 -07

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
IONOSPHERES  
PLANETARY ATMOSPHERES  
PARTICLES AND FIELDS

PERSONNEL

PI - J.D.	WINNINGHAM	U OF TEXAS, DALLAS
OI - P.M.	BANKS	UTAH STATE U
OI - J.L.	BURCH	SOUTHWEST RES INST
OI - R.G.	GUNTON	LOCKHEED PALO ALTO
OI - W.L.	IRHOFF	LOCKHEED PALO ALTO
OI - J.B.	REAGAN	U OF ALASKA
OI - M.H.	REES	NOAA
OI - G.C.	REID	NATL CTR FOR ATMOS RES
OI - R.G.	ROBLE	NATL CTR FOR ATMOS RES
OI - P.J.	CRUTZEN	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

THE OBJECTIVE OF THIS INVESTIGATION IS TO DETERMINE THE GLOBAL INPUT OF CHARGED PARTICLE ENERGY INTO THE EARTH'S STRATOSPHERE, MESOSPHERE, AND THERMOSPHERE AND THE PREDICTED ATMOSPHERIC PROCESSES. DIRECT IN SITU MEASUREMENTS OF PRECIPITATION ELECTRONS IN THE ENERGY RANGE FROM 100 EV TO 5 MEV AND OF PROTONS IN THE ENERGY RANGE FROM 0.5 TO 200 MEV (WITH OPTION OF EXTENDING PROTON MEASUREMENTS DOWN TO 100 EV) ARE MADE WITH A MEDIUM ENERGY PARTICLE SPECTROMETER (MEPS) AND A HIGH ENERGY PARTICLE SPECTROMETER (HEPS). IN ADDITION, GLOBAL IMAGES AND ENERGY SPECTRA OF ATMOSPHERIC X RAYS PRODUCED BY ELECTRON PRECIPITATION ARE PERFORMED OVER THE ENERGY RANGE FROM 6 TO 150 KEV WITH AN ATMOSPHERIC X RAY IMAGING SPECTROMETER. THE DATA FROM THESE INSTRUMENTS ARE USED AS INPUT TO COMPUTATIONAL MODELS.

----- UARS-2, ZUREK -----

INVESTIGATION NAME- RADIATIVE-DYNAMIC BALANCES IN THE MESOSPHERE

NSSDC ID- UARS-2 -23

INVESTIGATIVE PROGRAM  
CODE EB

INVESTIGATION DISCIPLINE(S)  
ATMOSPHERIC PHYSICS  
PLANETARY ATMOSPHERES  
METEOROLOGY

PERSONNEL

PI - R.W.	ZUREK	NASA-JPL
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BRIEF DESCRIPTION

THE OVERALL OBJECTIVE OF THIS INVESTIGATION IS TO CONSTRUCT A COMPREHENSIVE AND CONSISTENT CLIMATOLOGY OF THE MESOSPHERE AS OBSERVED BY THE UARS SATELLITES. FROM THE MESOSPHERIC DATA, THIS ANALYSIS PRODUCES: (1) THE RADIATIVE BUDGET BASED ON O<sub>3</sub> AND O<sub>2</sub> ABSORPTION OF SOLAR RADIANCE AND CO<sub>2</sub> EMISSION, INCLUDING THE EFFECTS ON THE LATTER OF NON-THERMODYNAMIC EQUILIBRIUM; AND (2) THE DYNAMICAL CLIMATOLOGY OF THE MESOSPHERE, SHOWING THE RELATIVE CONTRIBUTIONS TO THE HEAT AND MOMENTUM BUDGETS BY ADIABATIC HEATING, BY THE MEAN MERIDIONAL CIRCULATION, AND BY EDDIES (WAVES). THE EDdy CONTRIBUTION IS SEPARATED INTO STANDING AND TRANSIENT COMPONENTS WHICH INCLUDE DYNAMICAL FLUXES DUE TO ATMOSPHERIC TIDES.

**4**

**INDEX OF ACTIVE AND PLANNED SPACECRAFT  
AND EXPERIMENTS**

#### 4. INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

This index contains the names of all spacecraft and experiments that were either active sometime between June 1, 1979, and May 31, 1980, or planned as of May 31, 1980. The spacecraft are listed alphabetically by both common name and alternate names. The alternate names are printed with a reference to the NSSDC spacecraft common name. Next to the NSSDC spacecraft common name are the sponsoring country and agency, launch date, orbit type, NSSDC ID code, and the current status. The current state includes the epoch date, status, and data rate of all launched spacecraft and experiments. For prelaunch spacecraft, only the status is shown; there is no information shown for prelaunch spacecraft experiments. The status and data rate, for the most part, reflect the state as of May 31, 1980, that became effective on the listed epoch date. However, a few changes subsequent to this date may appear. An explanation of the terms used in these columns may be found in Appendix C. The experiments are listed following the associated spacecraft common name and are ordered alphabetically by the principal investigator's or team leader's last name. The experiment name, NSSDC ID code, and current state are also given for each experiment. Finally, each name is followed by a page number referencing the description of the spacecraft or experiment found in this report.

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**INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS  
BY SPACECRAFT NAMES AND PRINCIPAL INVESTIGATOR**

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INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS  
BY SPACECRAFT NAMES AND PRINCIPAL INVESTIGATOR

* * SPACECRAFT NAME * * SPRING.INVEST.NAME	COUNTRY AND AGENCY * * EXPERIMENT NAME	LAUNCH DATE	ORBIT TYPE	-----CURRENT STATUS-----				
				NSSDC ID	EPOCH MMDDYY	STATUS	DATA RATE	PAGE NO.
HAUBER	DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIRBE)			COBE	-02			108
MATHER	Far Infrared Absolute Spectrophotometer (FIRAS)			COBE	-01			109
SHOOT	DIFFERENTIAL MICROWAVE RADIOMETERS (DMR)			COBE	-03			109
COPERNICUS	SEE OAO 3							
CORSA-B	SEE HAKUCHO							
COS-B	INTERNATIONAL CARAVANE COLLABOR.	ESA GAMMA-RAY ASTRONOMY SPARK CHAMBER EXPERIMENT (25 - 1000 MeV)	08/09/75 GEOCENTRIC	75-072A 75-072A-01	08/09/75 08/09/75	NORMAL NORMAL	STND STND	15 15
COSMIC BACKGROUND EXPL	SEE COBE							
COSMIC RADIATION SAT B	SEE HAKUCHO							
COSMIC RAY SATELLITE-B	SEE COS-B							
COSMOS 900	U.S.S.R.	SAS FLAT RETARDING POTENTIAL ANALYZER HIGH-FREQUENCY ELECTRON TEMPERATURE PROBE	05/30/77 GEOCENTRIC	77-023A 77-023A-01 77-023A-02	10/11/79 10/11/79 10/11/79	INOPERABLE INOPERABLE INOPERABLE	ZERO ZERO ZERO	16 16 16
GDALEVICH	SUPERICAL ION TRAP WITH FLOATING POTENTIAL			77-023A-03	10/11/79	INOPERABLE	ZERO	16
GDALEVICH	CYLINDRICAL ELECTROSTATIC PROBE			77-023A-04	10/11/79	INOPERABLE	ZERO	16
GORTCHAKOV	RELATIVISTIC PROTON AND ELECTRON COUNTER			77-023A-08	10/11/79	INOPERABLE	ZERO	16
SCHUTTE	PANORAMIC ELECTROSTATIC SPECTROMETER			77-023A-07	10/11/79	INOPERABLE	ZERO	16
SOSHNOVETS	DIFFERENTIAL ENERGY SPECTROMETER			77-023A-05	10/11/79	INOPERABLE	ZERO	17
TELTSOV	DIFFERENTIAL LOW ENERGY SPECTROMETER			77-023A-06	10/11/79	INOPERABLE	ZERO	17
TULUPOV	AURORAL PHOTOMETER			77-023A-09	10/11/79	INOPERABLE	ZERO	17
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DMSP 13536	SEE DMSP SD-1/F2							
DMSP 14537	SEE DMSP SD-1/F3							
DMSP 15539	SEE DMSP SD-1/F4							
DMSP 50-1/F1	UNITED STATES AFGWC STAFF	DOE-USAF OPERATIONAL LINESCAN SYSTEM (OLS) RADIATION DOSIMETER GAMMA RAY DETECTOR	09/11/76 GEOCENTRIC	76-091A 76-091A-01 76-091A-03 76-091A-04	09/16/79 09/16/79 09/16/79 09/16/79	INOPERABLE INOPERABLE INOPERABLE INOPERABLE	ZERO ZERO ZERO ZERO	17 17 17 18
DMSP 50-1/F2	UNITED STATES AFGWC STAFF AFGWC STAFF	DOE-USAF OPERATIONAL LINESCAN SYSTEM (OLS) VERTICAL TEMPERATURE PROFILE RADIOMETER SPECIAL SENSOR M (SSM)	06/05/77 GEOCENTRIC	77-044A 77-044A-01 77-044A-02	02/17/80 02/17/80 02/17/80	INOPERABLE INOPERABLE INOPERABLE	ZERO ZERO ZERO	18 18 18
MIZERA	REPOTE X-RAY SENSOR - PRECIPITATING ELECTRONS			77-044A-06	02/17/80	INOPERABLE	ZERO	19
ROTHWELL	PRECIPITATING ELECTRON SPECTROMETER			77-044A-03	02/17/80	INOPERABLE	ZERO	19
SAGALYN	IONOSPHERIC PLASMA MONITOR			77-044A-05	02/17/80	INOPERABLE	ZERO	19
SNYDER	PASSIVE IONOSPHERIC MONITOR			77-044A-04	02/17/80	INOPERABLE	ZERO	19
DMSP 50-1/F3	UNITED STATES AFGWC STAFF AFGWC STAFF	DOE-USAF OPERATIONAL LINESCAN SYSTEM (OLS) VERTICAL TEMPERATURE PROFILE RADIOMETER SPECIAL SENSOR M (SSM)	05/01/78 GEOCENTRIC	78-042A 78-042A-01 78-042A-02	12/02/79 03/12/80 01/03/80	PARTIAL PARTIAL INOPERABLE	SUGS SUBS ZERO	19 19 20
SHRUM	GAMMA-RAY DETECTOR			78-042A-04	05/01/78	NORMAL	STND	20
DMSP 50-1/F4	UNITED STATES AFGWC STAFF AFGWC STAFF	DOE-USAF OPERATIONAL LINESCAN SYSTEM (OLS) VERTICAL TEMPERATURE PROFILE RADIOMETER SPECIAL SENSOR M (SSM)	06/06/79 GEOCENTRIC	79-050A 79-050A-01 79-050A-02	12/31/79 12/31/79 12/29/79	PARTIAL PARTIAL NORMAL	STND STND ZERO	20 20 21
AFGWC STAFF	SSP/T-MICROWAVE TEMPERATURE SOUNDER SNOW/CLOUD DISCRIMINATOR SPECIAL SENSOR C (SSC)			79-050A-06 79-050A-08	01/28/80 12/29/79	PARTIAL NORMAL	STND ZERO	21 21
MORSE	SSD - ATMOSPHERIC DENSITY SENSOR			79-050A-07	12/29/79	INOPERABLE	ZERO	21
ROTHWELL	PRECIPITATING ELECTRON SPECTROMETER			79-050A-03	01/28/80	PARTIAL	STND	21
SAGALYN	IONOSPHERIC PLASMA MONITOR			79-050A-05	01/28/80	PARTIAL	STND	21
SNYDER	PASSIVE IONOSPHERIC MONITOR			79-050A-04	01/28/80	PARTIAL	STND	21
DMSP 50-1/F5	UNITED STATES AFGWC STAFF AFGWC STAFF	DOE-USAF OPERATIONAL LINESCAN SYSTEM (OLS) VERTICAL TEMPERATURE PROFILE RADIOMETER SPECIAL SENSOR M (SSM)	GEOCENTRIC	DMSP-F5 DMSP-F5-01 DMSP-F5-02		APPROVED MISSION		109 109 110
ROTHWELL	PRECIPITATING ELECTRON SPECTROMETER IONOSPHERIC PLASMA MONITOR			DMSP-F5-03 DMSP-F5-05				110 110

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DMSP-F4	SEE DMSP SD-1/F4							
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DMSPSD1	SEE DMSP SD-1/F3							
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BURCH	HIGH ALTITUDE PLASMA INSTRUMENT			DE-A	-05			110
CHAPPELL	RETARDING ION MASS SPECTROMETER			DE-A	-04			111
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FRANK	GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS			DE-A	-03			111
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PETERSEN PETIT UNGSTRUP	DC FIELDS BY DOUBLE PROBE VLF PLASMA RESONANCES	78-071A-08	08/01/78 NORMAL	STND	23			
WILKEN	ELECTRIC WAVE FIELDS ELECTRON AND PROTON PITCH ANGLE	78-071A-07	08/01/78 NORMAL	STND	23			
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EXOSAT BOYD TAYLOR TRUMPER	INTERNATIONAL LOW-ENERGY X-RAY IMAGING TELESCOPES GAS SCINTILLATION X-RAY SPECTROMETER MEDIUM-ENERGY COSMIC X-RAY PACKAGE	ESA 11/00/91 GEOCENTRIC		EXOSAT EXOSAT -02 EXOSAT -03 EXOSAT -01		APPROVED MISSION	117	118
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FIREWHEEL SUB-SAT 1 ACUNA GURNETT PASCHMANN SPENNER	INTERNATIONAL DC MAGNETOMETER PLASMA WAVE LOW-ENERGY ELECTRON AND ION DETECTOR RETARDING POTENTIAL ANALYZER	ESA 05/23/80 GEOCENTRIC		FIRE-E FIRE-E -01 FIRE-E -04 FIRE-E -02 FIRE-E -03		FAILED MISSION	119	119
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HCMN	UNITED STATES NASA-OSTA	04/26/78	GEOCENTRIC	78-041A	04/26/78	NORMAL	STND	30
BARNES	HEAT CAPACITY MAPPING RADIOMETER	78-041A-01	05/01/79	PARTIAL	SUBS	30		
HEAD 2	UNITED STATES NASA-OSS	11/15/78	GEOCENTRIC	78-103A	11/13/78	NORMAL	STND	30
GIACCONI	MONITOR PROPORTIONAL COUNTER	78-103A-01	11/15/78	NORMAL	STND	30		
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HELIOS 1	SEE HELIOS-A							
HELIOS 2	SEE HELIOS-B							
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FECHTIG	MICROMETEOROID DETECTOR AND ANALYZER			74-097A-12	12/10/74	NORMAL	STND	32
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NESS	FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS			74-097A-02	12/10/74	NORMAL	STND	34
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FECHTIG	MICROMETEOROID DETECTOR AND ANALYZER			76-003A-12	05/19/80	INOPERABLE	ZERO	35
GURNETT	COARSE FREQUENCY, FINE TIME RESOLUTION			76-003A-04	05/19/80	INOPERABLE	ZERO	35
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GURNETT	50-KHZ TO 2-MHZ RADIO WAVE			76-003A-06	05/19/80	INOPERABLE	ZERO	35
KEPPLER	ENERGETIC ELECTRON DETECTOR			76-003A-10	05/19/80	INOPERABLE	ZERO	35
KUNDT	CELESTIAL MECHANICS			76-003A-14	05/19/80	INOPERABLE	ZERO	36
KUNOW	COSMIC-RAY PARTICLES			76-003A-07	05/19/80	INOPERABLE	ZERO	36
LEINERT	ZODIACAL LIGHT PHOTOMETER			76-003A-11	05/19/80	INOPERABLE	ZERO	36
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BAME	SOLAR PLASMA ELECTROSTATIC ANALYZER			73-078A-10	10/26/73	NORMAL	STND	37
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STONE	SOLAR FLARE HIGH-Z/LOW-E AND LOW-Z ISOTOPE			73-078A-07	10/26/73	NORMAL	STND	39
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IMP-K	SEE ISEE 1						
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INDIAN NATIONAL SAT.	SEE INSAT-1B						
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INT ULTRAVIOLET EXPL	SEE IUE						
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ISEE 1	UNITED STATES ANDERSON BAME CLINE FRANK GURNETT HARVEY HELLIWELL HEPPNER HOVESTADT MOZER OGILVIE RUSSELL SHARP WILLIAMS	NASA-OSS ELECTRONS AND PROTONS FAST PLASMA AND SOLAR WIND IONS GAMMA-RAY BURSTS HOT PLASMA PLASMA WAVES PLASMA DENSITY VLF WAVE PROPAGATION DC ELECTRIC FIELD LOW-ENERGY COSMIC RAYS QUASI-STATIC ELECTRIC FIELDS FAST ELECTRONS FLUXGATE MAGNETOMETER ION COMPOSITION ENERGETIC ELECTRONS AND PROTONS	10/22/77 GEOCENTRIC	77-102A 77-102A-10 77-102A-01 77-102A-14 77-102A-03 77-102A-07 77-102A-08 77-102A-13 77-102A-11 77-102A-05 77-102A-06 77-102A-02 77-102A-04 77-102A-12 77-102A-09	10/22/77 NORMAL 10/22/77 NORMAL 01/01/79 PARTIAL 10/22/77 NORMAL 10/22/77 NORMAL 10/22/77 NORMAL 10/22/77 NORMAL 10/22/77 NORMAL 10/22/77 NORMAL 08/07/78 PARTIAL 10/22/77 NORMAL 10/22/77 NORMAL 10/22/77 NORMAL 04/13/78 PARTIAL 10/02/79 INOPERABLE	STND STND STND STND STND STND STND STND STND STND STND STND STND STND STND ZERO	40 40 40 40 40 41 41 41 41 41 41 42 42 42 42 42
ISEE 2	INTERNATIONAL UNITED STATES	ESA NASA-OSS	10/22/77 GEOCENTRIC	77-102B	10/22/77 NORMAL	STND	43
	ANDERSON EGIDI FRANK GURNETT HARVEY PASCHMANN RUSSELL WILLIAMS	ELECTRONS AND PROTONS SOLAR WIND IONS HOT PLASMA PLASMA WAVES RADIO PROPAGATION FAST PLASMA FLUXGATE MAGNETOMETER ENERGETIC ELECTRONS AND PROTONS		77-102B-08 77-102B-02 77-102B-03 77-102B-05 77-102B-06 77-102B-01 77-102B-04 77-102B-07	05/01/79 PARTIAL 10/22/77 NORMAL 01/10/78 PARTIAL 10/22/77 NORMAL 10/22/77 NORMAL 04/08/80 INOPERABLE 10/22/77 NORMAL 10/22/77 NORMAL	STND STND STND STND STND ZERO STND STND	43 43 43 43 43 44 44 44
ISEE 3	UNITED STATES	NASA-OSS	08/12/78 HELIOCENTRIC	78-079A 78-079A-09 78-079A-14 78-079A-01 78-079A-05 78-079A-05 78-079A-08 78-079A-06 78-079A-11 78-079A-07 78-079A-02 78-079A-10 78-079A-12	08/12/78 NORMAL 11/22/79 INOPERABLE 08/15/78 NORMAL 03/19/80 PARTIAL 08/15/78 NORMAL 08/15/78 NORMAL 08/15/78 NORMAL 08/15/78 NORMAL 08/18/78 NORMAL 08/12/78 NORMAL 08/12/78 NORMAL 08/13/78 NORMAL 01/15/79 PARTIAL	STND ZERO STND STND STND STND STND STND STND STND STND STND STND STND	44 44 45 45 45 45 45 45 45 45 45 45 45 46

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TEEGARDEN VON ROSENVENGE WILCOX	GAMMA-RAY BURSTS MEDIUM ENERGY COSMIC RAY GROUND BASED SOLAR STUDIES	78-079A-15 78-079A-04 78-079A-12	01/15/79 08/15/78 NA	01/15/79 PARTIAL 08/15/78 NORMAL NA	STND STND NA	46 46 47		
ISEE-A	SEE ISEE 1							
ISEE-B	SEE ISEE 2							
ISEE-C	SEE ISEE 3							
ISIS 1	CANADA UNITED STATES	ERIC NASA-OSS	01/30/69 GEOCENTRIC	69-009A	01/30/70	PARTIAL	SUBS	47
BARRINGTON BRACE CALVERT HARTZ McDIARMID SAGALYN WHITTEKER	VLF RECEIVER CYLINDRICAL ELECTROSTATIC PROBE FIXED-FREQUENCY SOUNDER COSMIC RADIO NOISE ENERGETIC PARTICLE DETECTORS SPHERICAL ELECTROSTATIC ANALYZER SWEEP-FREQUENCY SOUNDER			69-009A-03 69-009A-07 69-009A-02 69-009A-10 69-009A-04 69-009A-08 69-009A-01	01/30/70 01/30/70 01/30/70 01/30/70 01/30/70 01/30/70 01/30/70	NORMAL NORMAL NORMAL NORMAL NORMAL NORMAL NORMAL	SUBS SUBS SUBS SUBS SUBS SUBS SUBS	47 47 47 48 48 48 48
ISIS 2	CANADA UNITED STATES	ERIC NASA-OSS	04/01/71 GEOCENTRIC	71-024A	02/04/73	PARTIAL	SUBS	48
ANGER BARRINGTON CALVERT HARTZ HOFFMAN MAIER McDIARMID SHEPHERD WHITTEKER	3914-A AND 5577-A PHOTOMETER VLF RECEIVER FIXED-FREQUENCY SOUNDER COSMIC RADIO NOISE ION-PASS SPECTROMETER RETARDING POTENTIAL ANALYZER ENERGETIC PARTICLE DETECTORS 6300-A PHOTOMETER SWEEP-FREQUENCY SOUNDER			71-024A-11 71-024A-03 71-024A-02 71-024A-10 71-024A-06 71-024A-08 71-024A-04 71-024A-12 71-024A-01	02/04/73 02/04/73 02/04/73 02/04/73 07/00/79 02/04/73 02/04/73 02/04/73 02/04/73	NORMAL NORMAL NORMAL NORMAL INOPERABLE NORMAL PARTIAL NORMAL NORMAL	SUBS SUBS SUBS SUBS ZERO SUBS SUBS SUBS SUBS	49 49 49 49 49 50 50 50 50
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ISP	SEE ISPM/ESA							
ISP	SEE ISPM/NASA							
ISPM-A	SEE ISPM/NASA							
ISPM-B	SEE ISPM/ESA							
ISPM/ESA	INTERNATIONAL NAME	ESA	04/18/85 HELIOCENTRIC	ISPESA		APPROVED MISSION		134
ESPUSITO GL/ECKLER GRUN HEDGELOCK HURLEY LANZEROTTI SIMPSON STONE	PLASMA SPECTROMETER RADIO SCIENCE SOLAR-BLIND COMPOSITION SPECTROMETER COSMIC DUST MAGNETIC FIELD SOLAR-FLARE X-RAYS AND COSMIC GAMMA RAY BLAST HELIOSPHERE COSMIC RAY AND CHARGED PARTICLE UNIFIED RADIO AND PLASMA WAVE			ISPESA-09 ISPESA-09 ISPESA-09 ISPESA-07 ISPESA-08 ISPESA-01 ISPESA-03 ISPESA-02 ISPESA-06				134 135 135 135 135 135 135 136 136
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ISS-B	JAPAN	RRL	02/16/78 GEOCENTRIC	78-018A	02/16/78	NORMAL	STND	50
AIKYO IWAMOTO KOTAKI OGAWA	SWEEP FREQUENCY TOPSIDE IONOSPHERIC SOUNDER (TOP) ION MASS SPEC - 1.5, 5, 10, AND 25 MHZ RADIO NOISE AT 1.5, 5, 10, AND 25 MHZ RETARDING POTENTIAL TRAP			78-018A-01	02/27/78	NORMAL	STND	51
IUE	UNITED STATES INTERNATIONAL UNITED KINGDOM	ESA	01/26/78 GECCENTRIC	78-012A	01/26/78	NORMAL	STND	51
GUEST INVESTIGATORS	LOW-/HIGH-RESOLUTION ULTRAVIOLET SPECTROGRAPH PACKAGE			78-012A-01	01/26/78	NORMAL	STND	52

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NONE ASSIGNED	PARTICLE FLUX MONITOR (SPACECRAFT)			78-012A-02	01/26/78	NORMAL	STND	52	
JIRIKEN	JAPAN ISAS	09/16/78	GEOCENTRIC	78-007A	09/16/78	NORMAL	STND	52	
UJIKI	IMPEDANCE AND ELECTRIC FIELD (IEF)			78-007A-04	09/25/78	NORMAL	STND	52	
KAWASHIMA	CONTROLLED ELECTRON BEAM EMISSIONS (CEB)			78-007A-07	09/23/78	NORMAL	STND	52	
KIRURA	VLF DOPPLER PROPAGATION (DPL)			78-007A-03	09/23/78	NORMAL	STND	53	
KODO	ENERGY SPECTRUM OF PARTICLES (ESP)			78-007A-06	09/23/78	NORMAL	STND	53	
OTA	STIMULATED PLASMA WAVE (SPW)			78-007A-01	09/25/78	NORMAL	STND	53	
OTA	NATURAL PLASMA WAVES (NPW)			78-007A-02	09/25/78	NORMAL	STND	53	
JOP	SEE GALILEO PROBE								
JOP	SEE GALILEO ORBITER								
JUPITER ORBITER PROBE	SEE GALILEO PROBE								
JUPITER ORBITER PROBE	SEE GALILEO ORBITER								
KYORHO	JAPAN ISAS	02/04/78	GEOCENTRIC	78-014A	11/09/79	INOPERABLE	ZERO	53	
IWANOTO	ION MASS SPECTROMETER			78-014A-06	11/09/79	INOPERABLE	ZERO	53	
KANEDA	UV AURORAL TV IMAGING			78-014A-03	11/09/79	INOPERABLE	ZERO	53	
MURAI	ELECTRON ENERGY ANALYZER			78-014A-02	11/09/79	INOPERABLE	ZERO	54	
NAKAMURA	UV GLOW SPECTROPHOTOMETER			78-014A-05	11/09/79	INOPERABLE	ZERO	54	
OTAMA	ELECTRON PROBES			78-014A-01	11/09/79	INOPERABLE	ZERO	54	
TOSHINO	ELECTROSTATIC PLASMA WAVE MEASUREMENT			78-014A-04	11/09/79	INOPERABLE	ZERO	54	
LAND SATELLITE-0	SEE LANDSAT-01								
LANDSAT 0	UNITED STATES NASA-GSTA	01/28/78	GEOCENTRIC	78-004A	05/06/78	NORMAL	SUBS	54	
BALLA	MULTISPECTRAL SCANNER (MSS)			78-004A-02	05/06/78	NORMAL	SUBS	54	
LANDSAT 1	UNITED STATES NASA-GSTA	03/09/78	GEOCENTRIC	78-026A	03/09/78	NORMAL	STND	55	
BALLA	MULTISPECTRAL SCANNER (MSS)			78-026A-02	07/11/78	PARTIAL	STND	55	
GILBERT	DATA COLLECTION SYSTEM (DCS)			78-026A-03	03/05/78	NORMAL	STND	55	
WILSON	RETURN BEAM VIDICON CAMERA (RBV)			78-026A-01	03/05/78	NORMAL	STND	55	
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WEINSTEIN	THEMATIC MAPPER			LAND-0 -01			138		
LANDSAT-01	UNITED STATES NASA-GSTA	1983	GEOCENTRIC	LAND-E		APPROVED MISSION	138		
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MAG-1K	SEE INTERCOSMOS 1B								
MAGIC	SEE INTERCOSMOS 1B								
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MAGSAT	UNITED STATES NASA-GSTA	10/30/78	GEOCENTRIC	79-094A	06/11/80	INOPERABLE	ZERO	56	
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MARINER JUPITER/SATURN A	SEE VOYAGER 1								
MARINER JUP.ITER/SATURN B	SEE VOYAGER 2								
MESI	SEE SMS 1								
MES2	SEE SMS 2								
METEOROLOGICAL SAT-A	SEE METEOSAT 1								
METEOROLOGICAL SAT-B	SEE METEOSAT 2								
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ESA STAFF	UNITED STATES	NASA-OSTA					
ESA STAFF	IMAGING RADIOMETER			77-100A-01	11/24/79	INOPERABLE	STND
	DATA COLLECTION PLATFORM (DCP)			77-100A-02	11/23/77	NORMAL	STND
METEORBAT 2	INTERNATIONAL	ESA	12/18/80	GEOCENTRIC	METOS-B	APPROVED MISSION	139
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RWS 77A	SEE VOYAGER 1						
RWS 77B	SEE VOYAGER 2						
MOTHER	SEE ISSEE 1						
MPE SUB-PAYOUT	SEE FIREWHEEL SUB-SAT 1						
NAT'L OCEANIC SATELLITE	SEE NOSS						
NIMBUS 4	UNITED STATES	NASA-OSTA	04/08/70	GEOCENTRIC	78-025A	01/01/70	PARTIAL
HEATH	BACKSCATTER ULTRAVIOLET (BUV)			78-025A-00	01/01/70	PARTIAL	STND
	SPECTROMETER						SUBS
NIMBUS 5	UNITED STATES	NASA-OSTA	12/11/72	GEOCENTRIC	78-097A	01/01/73	PARTIAL
HOUGHTON	SELECTIVE CHOPPER RADIOMETER (SCR)			78-097A-02	07/19/73	NORMAL	STND
WILHEITZ, JR.	ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)			78-097A-04	08/19/77	PARTIAL	SUBS
NIMBUS 6	UNITED STATES	NASA-OSTA	06/12/75	GEOCENTRIC	78-092A	01/01/76	PARTIAL
HOUGHTON	PRESSURE-MODULATED RADIOMETER (PMR)			78-092A-00	08/01/76	NORMAL	STND
JACOBOWITZ	EARTH RADIATION BUDGET (ERB)			78-092A-05	08/06/79	PARTIAL	SUBS
JULIAN	TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL (TWEEL)			78-092A-01	08/19/73	NORMAL	STND
NIMBUS 7	UNITED STATES	NASA-OSTA	10/24/78	GEOCENTRIC	78-098A	10/24/78	NORMAL
ALLISON	TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)			78-098A-10	10/24/78	NORMAL	STND
BLODSEN	SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMMR)			78-098A-00	10/24/78	NORMAL	STND
HEATH	SOLAR AND BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SYSTEM (SBUV/TOMS)			78-098A-07	10/24/78	NORMAL	STND
HOLIGHTON	STRATOSPHERIC AND TROPOSPHERIC BOUNDER (SAM)			78-098A-02	11/19/70	NORMAL	STND
HOVIS	COASTAL ZONE COLOR SCANNER (CZCS)			78-098A-03	10/29/78	NORMAL	STND
JACOBOWITZ	EARTH RADIATION BUDGET (ERB)			78-098A-07	11/19/78	NORMAL	STND
McCONNELL	STRATOSPHERIC AEROSOL MEASUREMENT-II (SAM-II)			78-098A-06	10/24/78	NORMAL	STND
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NIMBUS-E	SEE NIMBUS 5						
NIMBUS-F	SEE NIMBUS 6						
NIMBUS-G	SEE NIMBUS 7						
NOAA 6	UNITED STATES	NOAA-NESST	06/27/79	GEOCENTRIC	79-057A	06/27/79	NORMAL
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			79-057A-01	06/27/79	NORMAL	STND
	OPERATIONAL VERTICAL SOUNDER						SUBS
NESS STAFF	DATA COLLECTION SYSTEM			79-057A-02	06/27/79	NORMAL	STND
WILLIAMS	SPACE ENVIRONMENT MONITOR			79-057A-03	06/27/79	NORMAL	STND
				79-057A-04	06/27/79	NORMAL	STND
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	UNITED STATES	NASA-OSTA					
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NESS STAFF	DATA COLLECTION SYSTEM (DCS)			NOAA-C-03			140
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NOAA-D	UNITED STATES	NOAA-NESST	04/15/82	GEOCENTRIC	NOAA-D		APPROVED MISSION
	UNITED STATES	NASA-OSTA					
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NESS STAFF	DATA COLLECTION SYSTEM (DCS)					NOAA-D -03				141
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NESS STAFF	OPERATIONAL VERTICAL SOUNDER					NOAA-E -02				142
NESS STAFF	DATA COLLECTION SYSTEM (DCS)					NOAA-E -03				142
WILLIAMS	SPACE ENVIRONMENT MONITOR					NOAA-E -04				143
NOAA-F	UNITED STATES	NOAA-NESS	04/15/84	GEOCENTRIC		NOAA-F		APPROVED MISSION		143
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NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)					NOAA-G -01				144
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FAN	COSMIC-RAY TELESCOPE				65-105A-03	12/03/74	NORMAL	SUBS	65	
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MCCRACKEN	COSMIC-RAY ANISOTROPY				65-105A-05	12/03/74	PARTIAL	SUBS	65	
WOLFE	ELECTROSTATIC ANALYZER				65-105A-06	12/03/74	NORMAL	SUBS	65	
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ANDERSON	CELESTIAL MECHANICS				68-100A-08	11/08/68	NORMAL	STND	66	
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JUDGE	ULTRAVIOLET PHOTOMETRY	72-012A-06	03/03/72	NORMAL	STND	68		
KINARD	METEOROID DETECTORS	72-012A-04	03/03/72	NORMAL	STND	68		
KLIORE	S-BAND OCCULTATION	72-012A-10	12/05/73	NORMAL	ZERO	69		
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SIMPSON	CHARGED PARTICLE COMPOSITION	72-012A-02	03/03/72	NORMAL	STND	69		
VAN ALLEN	JOVIAN CHARGED PARTICLES	72-012A-11	03/03/72	NORMAL	STND	69		
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ACUNA	JOVIAN MAGNETIC FIELD	73-019A-14	09/07/79	INOPERABLE	ZERO	70		
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MCDONALD	COSMIC-RAY SPECTRA	73-019A-12	04/06/73	NORMAL	STND	71		
SIMPSON	CHARGED PARTICLE COMPOSITION	73-019A-02	04/06/73	NORMAL	STND	72		
SMITH	MAGNETIC FIELDS	73-019A-01	04/06/73	NORMAL	STND	72		
VAN ALLEN	JOVIAN CHARGED PARTICLES	73-019A-11	04/06/73	NORMAL	STND	72		
WOLFE	PLASMA	73-019A-13	12/04/77	NORMAL	STND	72		
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EVANS	TRANSIENT GAMMA-RAY SOURCES	78-051A-05	05/20/78	NORMAL	STND	73		
HANSEN	CLOUD PHOTOPOLARIMETER	78-051A-06	05/20/78	NORMAL	STND	73		
KNUDSEN	RETARDING POTENTIAL ANALYZER	78-051A-07	05/20/78	NORMAL	STND	73		
RASURSKY	PARTICIPATING THEORIST RASURSKY	78-051A-08	NA	NA	NA	74		
McGILL	PARTICIPATING THEORIST MCGILL	78-051A-09	NA	NA	NA	74		
NAGY	PARTICIPATING THEORIST NAGY	78-051A-10	NA	NA	NA	74		
NIEMANN	NEUTRAL PARTICLE MASS SPECTROMETER	78-051A-11	12/05/78	NORMAL	STND	74		
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ESTULIN	GAMMA-RAY SPECTROMETER	78-101A-03	06/00/79	NORMAL	ZERO	75		
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<del>SPRING INVEST. KINE</del>									
	MCCORMICK	STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE)			79-013A-01	06/12/79	PARTIAL	SUBS	77
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		RETARDING POTENTIAL ANALYZER (IPA)							
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BARTH		INFRARED RADIOMETER			SME	-02			150
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BARTH		VISIBLE NITROGEN DIOXIDE			SME	-04			150
BARTH		SOLAR UV MONITOR			SME	-05			150
BARTH		SOLAR PROTON ALARM			SME	-06			151
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CHUPP		GAMMA RAY SPECTROMETER (GRS)			80-014A-07	02/17/80	NORMAL	STND	78
DE JAGER		HARD X-RAY IMAGING SPECTROMETER (HXRIS)			80-014A-05	02/21/80	NORMAL	STND	78
FROST		HARD X-RAY BURST SPECTROMETER (HXRBS)			80-014A-06	02/19/80	NORMAL	STND	78
HOUSE		CORONAGRAPH/POLARIMETER			80-014A-01	02/20/80	NORMAL	STND	78
TANDBERG-HANSEN		ULTRAVIOLET SPECTROMETER AND POLARIMETER			80-014A-02	02/21/80	NORMAL	STND	79
WILLSON		ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR			80-014A-08	02/16/80	NORMAL	STND	79
SMS 1	UNITED STATES	NOAA-HESS	05/17/74	GEOCENTRIC	74-033A	01/00/80	NORMAL	STND	79
NESS STAFF	UNITED STATES	NASA-OSTA			74-033A-01	04/19/79	PARTIAL	ZERO	79
NESS STAFF		VISIBLE-INFRARED SPIN-SCAN RADIOMETER (VISSR)			74-033A-05	04/19/79	PARTIAL	ZERO	79
		METEOROLOGICAL DATA COLLECTION AND TRANSMISSION SYSTEM							
WILLIAMS		ENERGETIC PARTICLE MONITOR			74-033A-02	01/00/80	NORMAL	STND	80
WILLIAMS		SOLAR X-RAY MONITOR			74-033A-03	01/00/80	NORMAL	STND	80
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## **APPENDIXES**

#### APPENDIX A - OTHER RELEVANT SPACECRAFT

Spacecraft relevant to the purpose of this report and not included elsewhere are listed in this appendix. Also listed here are missions which were planned to be launched during the reporting period but failed at launch. The spacecraft include those that have been published in earlier reports of this series and now have a status of canceled, failed at launch, or mission being rescoped. Included are essentially dormant spacecraft which are used to provide new science and technology information incorporating ground-based facilities and techniques. In this latter group are the air density studies using air drag effects and ground-based photography, radio beacon receptions, celestial mechanics studies using spacecraft motions and radio transmissions, and laser retroreflector studies. In addition, some spacecraft that were turned off but were still operable in the last report and dropped from this one are listed; it is extremely unlikely these will ever be re-activated. The spacecraft are listed alphabetically by the NSSDC spacecraft common name. Listed with each spacecraft are the sponsoring country and agency, the actual launch date, the NSSDC ID code, and the status. A definition of the terms used in the current status column can be found in Appendix C.

<u>Spacecraft Name</u>	<u>Sponsoring Country and Agency</u>		<u>Launch Date</u>	<u> NSSDC ID</u>	<u>Current Status</u>
AD-A	United States	NASA-OSS	12/19/63	63-053A	Air Density Studies
AD-C	United States	NASA-OSS	08/08/68	68-066A	Air Density Studies
Apollo 11	United States	NASA-CMSF	07/16/69	69-059C	Laser Retroreflector
Apollo 14	United States	NASA-CMSF	01/31/71	71-008C	Laser Retroreflector
	United States	NASA-OSS			
Apollo 15	United States	NASA-CMSF	07/26/71	71-063C	Laser Retroreflector
	United States	NASA-OSS			
ATS 5	United States	NASA-OSTA	08/12/69	69-069A	Radio Beacon
ATS 6	United States	NASA-OSTA	05/30/74	74-039A	*Abandoned 06/30/79
BE-C	United States	NASA-OSS	04/29/65	65-032A	Laser Retroreflector
ESA-GEOS 1	International	ESA	04/20/77	77-029A	Operational Off 05/29/79
Firewheel	International	ESA	05/23/80		+Failed at launch
Firewheel Sub-payload 1	"	"	"		"
Firewheel Sub-payload 2	"	"	"		"
Firewheel Sub-payload 3	"	"	"		"
Firewheel Sub-payload 4	"	"	"		"
GEOS 1	United States	NASA-OSS	11/06/65	65-089A	Laser Retroreflector
GEOS 2	United States	NASA-OSS	01/11/68	68-002A	Laser Retroreflector
IMP-H	United States	NASA-OSS	09/23/72	72-073A	*Abandoned 10/31/78
LAGEOS	United States	NASA-OSTA	05/04/76	76-039A	Laser Retroreflector
NOAA-B	United States	NOAA-NESS	05/30/80	80-043A	+Failed at launch
	United States	NASA-OSTA			
NOAA 5	United States	NOAA-NESS	07/29/79	76-077A	*Abandoned 03/01/79
	United States	NASA-OSTA			
Pioneer 7	United States	NASA-OSS	08/17/66	66-075A	Celestial Mechanics
Pioneer 8	United States	NASA-OSS	12/13/67	67-123A	Celestial Mechanics
83-3	United States	DOD-USAFAF	07/08/76	76-065B	*Abandoned 05/15/79

\*The spacecraft is unlikely to be re-activated or is now inoperable.

†Used for engineering and test purposes.

‡The spacecraft and experiment descriptions are included in the 'Active' (NOAA-B) and 'Planned' (Firewheel and subpayloads) sections of this report for reference.

## APPENDIX B - SPECIAL INVESTIGATORS

### B1. Joint IRAS Science Working Group

The Infrared Astronomy Satellite (IRAS), like IUE, does not have individual principal investigators or team leaders associated with each experiment. Operation of the spacecraft is by the Joint IRAS Science Working Group. Members of this Working Group and their affiliation are listed.

### B2. The Caravane Collaboration (COS-B)

The gamma-ray astronomy experiment for COS-B was built, operated, and the data analyzed by a collaboration of six European research groups. Group members that have played a significant role in the implementation of the program are listed with their affiliation.

### B3. Individual Galileo Investigations

The Orbiter Imaging and Radio Science investigations include individual studies. The individual investigation name, the objectives, and the investigator and his affiliation are listed.

### B4. AMPTE/Charge Composition Explorer (CCE)/Ion Release Module (IRM) Scientific Team

The AMPTE/Charge Composition Explorer/Ion Release Module investigations are conducted by an international scientific team. The members of this scientific team and their affiliation are listed. The Co-Principal Investigators are indicated by an asterisk. This team has rights to the data from each investigation on the two missions while the experiment personnel listed in Section 3.3 have rights only to data from their experiment.

### B5. Copernicus Guest Investigators and Investigations

Copernicus (OAO 3) was used by a number of special investigators. The investigation name, the guest investigators, and their affiliation are listed in Appendix B5.

### B6. International Solar Polar Mission (ISPM) Theoretical and Interdisciplinary Scientists

The names and affiliation of ISPM theoretical and interdisciplinary scientists are listed.

### B7. List of NASA-Selected Magsat Investigators

Investigators who use one or both of the magnetometers on Magsat are listed with their investigations.

**B1. Joint Infrared Astronomy Satellite (IRAS) Science Working Group**

<u>Member</u>	<u>Affiliation</u>
Aumann, H. H.	NASA-Jet Propulsion Laboratory
Beintema, D.	University of Groningen, The Netherlands
Borgman, J.	University of Groningen, The Netherlands
Clegg, P.	Queen Mary College, London University, UK
Dejong, T.	University of Leiden, The Netherlands
Gillette, F.	Kitt Peak National Observatory
Habing, A.	University of Leiden, The Netherlands
Hauser, M.	NASA-Goddard Space Flight Center
Houck, J.	Cornell University
Jennings, R.	University College, London University, UK
Low, F.	University of Arizona
Marsden, P.	University of Leeds, UK
Neugebauer, G.	California Institute of Technology (U.S. Principal Scientist, Co-Chairman)
Pottasch, S.	University of Groningen, The Netherlands
Soifer, T.	California Institute of Technology
Van Duinen, R.	University of Groningen, The Netherlands (European Principal Scientist, Co-Chairman)
Walker, R.	NASA-Ames Research Center

B2. The Caravane Collaboration (COS-B)

<u>Member</u>	<u>Affiliation</u>
Bennett, K.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
Bignami, G. F.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Boella, G.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Buccheri, R.	Università di Palermo, Italy
Burger, J. J.	Scientific Projects Department, ESA-ESTEC Noordwijk, The Netherlands
D'Amico, N.	Università di Palermo, Italy
Hermanssen, W.	Huygens Laboratorium Leiden, The Netherlands
Kanbach, G.	Max-Planck-Institut für Physik und Astrophysik, Garching bei München, Federal Republic of Germany
Koch, L.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Labeyrie, J.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Lichti, G. G.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
Lust, R.	Max-Planck-Institut für Physik und Astrophysik, Garching bei München, Federal Republic of Germany
Masnou, J.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Mayer-Hasselwander, H. A.	Max-Planck-Institut für Physik und Astrophysik, Garching bei München, Federal Republic of Germany

B2 concluded

<u>Member</u>	<u>Affiliation</u>
Occhialini, G. P.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Paul, J. A.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Pinkau, K.	Max-Planck-Institut für Physik und Astrophysik, Garching bei München, Federal Republic of Germany
Sacco, B.	Università di Palermo, Italy
Scarsi, L.	Università di Palermo, Italy
Swanenburg, B. N.	Huygens Laboratorium Leiden, The Netherlands
Taylor, B. G.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
Trendelenburg, E. A.	ESA Headquarters, Paris, France
van de Hulst, H. C.	Huygens Laboratorium Leiden, The Netherlands
Wills, R. D.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands

B3. INDIVIDUAL GALILEO INVESTIGATIONS

IMAGING INVESTIGATIONS

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Jovian Auroral Studies	To search for and investigate Jupiter's auroras; to use auroral imaging to obtain information on the configuration and dynamics of the Jovian magnetosphere; to search for luminous phenomena on the dark sides of the Galilean satellites	Clifford D. Anger University of Calgary/ Canada
Structure and Dynamics of the Jovian Atmosphere	To investigate the physical structure and dynamical regimes of the Jovian atmosphere, including cloud motion, heat transfer, cloud composition and scattering properties, and atmosphere wave motions	Michael J. S. Belton Kitt Peak National Observatory
Geological Histories of the Galilean Satellites	To investigate the geologic histories of the Galilean satellites by photogeologic techniques to determine surface morphology and measure local elevations and height contours, and by the preparation of contour maps and geological maps	Michael H. Carr U.S. Geological Survey

B3 continued

GALILEO IMAGING INVESTIGATIONS

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Jovian Atmospheric Dynamics and Satellite Histories	To study dynamics of the upper atmosphere of Jupiter by determining cloud motions and evolution; to synthesize Galileo imagery with previous imagery, including ground-based patrol photography; to study surface histories of the Galilean satellites, particularly by crater density and morphology; and to investigate possibilities to make imaging studies of smaller Jovian satellites and of asteroid targets of opportunity	Clark R. Chapman Planetary Science Institute
Geodetics of the Galilean Satellites	To establish a geodetic net on the Galilean satellites and determine their radii, shapes, and rotational poles; to provide satellite control nets for precision cartography	Merton E. Davies Rand Corporation
Geological Exploration of the Galilean Satellites	To investigate the geology of the Galilean satellites using photogeological techniques, with emphasis on cratering, tectonic processes, and the discovery of new geological processes associated with the presence of icy crusts on the satellites	Ronald Greeley Arizona State University

## GALILEO IMAGING INVESTIGATIONS

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Dynamical Properties of the Galilean Satellites	To study the internal structure and past history of the Galilean satellites from dynamical studies of shape and rotation; to investigate impact cratering and chronology; to search for previously undiscovered satellites in the Jovian system	Richard Greenberg Planetary Science Institute
Geology of the Galilean Satellites	To investigate surface morphology and infer geologic histories of the Galilean satellites, with emphasis on impact cratering processes and comparative studies with the terrestrial planets	James W. Head, III Brown University
Photogeology of the Galilean Satellites	To investigate the geology of the Galilean satellites with emphasis on impact cratering processes; to develop a multispectral image processing capability and imaging data library in Europe	Gerhard Neukum Munich University, Federal Republic of Germany
Photometry and Imaging of Jupiter and the Galilean Satellites	To investigate the Jovian atmosphere and cloud properties by multispectral photometry and polarimetry; to study surface composition of the Galilean satellites with emphasis on the role of volatiles; to search for auroral emissions from the interaction of satellite atmospheres with the Jovian magnetosphere	Carl B. Pilcher University of Hawaii

B3 continued

GALILEO IMAGING INVESTIGATIONS

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Jovian Atmospheric Circulation	To investigate the nature of the thermal and dynamical processes responsible for the atmospheric circulation of Jupiter and the ways that these processes are influenced by the structure of the cloud layers	Gerald Schubert University of California, Los Angeles
Imaging, Spectro-photometry, and Polarimetry of the Galilean Satellites and Jupiter	To investigate the surface morphology and spectrophotometric properties of the Galilean satellites; to identify compositional units of the satellites; to obtain photometry of Jovian belts and zones to investigate cloud properties and energy balance; to investigate possibilities for making photo-polarimetric observations of the smaller Jovian satellites	Joseph Veverka Cornell University
Multispectral Radio-metric Imaging of Jupiter and the Galilean Satellites	To participate closely in the development of a multispectral radio-metric imaging capability for Galileo, including design of the camera system, its calibration, and development of image processing software; to use these multispectral images to study compositional differences on the surfaces of the Galilean satellites and in the atmosphere of Jupiter	John B. Wellman Jet Propulsion Laboratory

## GALILEO RADIO SCIENCE

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Celestial Mechanics Measurements of Jupiter and Its Satellites	To use closed-loop radiometric data from the Galileo orbiter to: (1) determine the structure of the gravitational fields of Jupiter and the Galilean satellites; (2) determine the relativistic time delay during the solar conjunction of Jupiter; and (3) improve the determination of the orbits of Jupiter and its satellites. Also, to measure the general relativistic redshift in the gravitational field of Jupiter (by using one-way Doppler data)	John D. Anderson Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to measure the vertical pressure and temperature profiles and atmospheric absorptivity on Jupiter, the Jovian ionospheric structure and dynamics, and the plasma environment of the Galilean satellites; to use phase and intensity scintillation data to study atmospheric turbulence and convection on Jupiter; and to investigate the use of bistatic radar techniques to study the surfaces of the Galilean satellites	Von R. Eshleman Stanford University

B3 continued

GALILEO RADIO SCIENCE

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Search for Gravitational Radiation	To use high-precision Doppler monitoring during cruise to conduct a systematic search for very low frequency gravitational waves incident on the solar system, to a level of strain amplitude of about 1.E-15	Frank B. Estabrook Jet Propulsion Laboratory
Jupiter Radio Astronomy	To study relativistic electrons in the Jovian magnetosphere by measuring the integrated radio flux near 400 MHz (using the Probe relay antenna) over a large range in time and geometry	Eric Gerard Meudon Observatory
Microwave Investigation of Jupiter	To use the Probe relay antenna to study the trapped radiation belts of Jupiter and to measure the thermal microwave radiation from the planet with high spatial resolution. Also, to measure the thermal microwave brightness of the Galilean satellites in order to study their surface properties	Samuel Gulkis Jet Propulsion Laboratory

B3 concluded

GALILEO RADIO SCIENCE

<u>Investigation Name</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on the neutral atmospheres. For Jupiter, the occultation data determine temperature, pressure, and density profiles down to the 100 mb pressure level. In addition, deviations of the local vertical direction from the predicted value will be determined and used to study zonal wind velocities in the Jovian atmosphere	Arvydas J. Kliore Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on ionospheric measurements. In the ionosphere, the occultation data yield electron number density and plasma scale height profiles	Gunnar Lindal Jet Propulsion Laboratory
Radio Scintillation in the Jovian Atmosphere	To use spacecraft radio scintillations to measure and study turbulence in the Jovian atmosphere, and electron density irregularities, magnetic field direction, and winds in the Jovian ionosphere. Also, where possible, to take similar measurements of the Galilean satellites	Richard Woo Jet Propulsion Laboratory

B4. AMPTE/Charge Composition Explorer (CCE)/Ion Release Module (IRM) Scientific Team

<u>Member</u>	<u>Affiliation</u>
Bostrom, C. O. Fpoppl, H.	Applied Physics Laboratory Max-Planck-Institut für Extraterrestrische Physik, Garching bei München Federal Republic of Germany
Gloeckler, G. *Haerendel, G.	University of Maryland Max-Planck-Institut für Extraterrestrische Physik, Garching bei München Federal Republic of Germany
Hausler, B.	Max-Planck-Institut für Extraterrestrische Physik, Garching bei München Federal Republic of Germany
*Krimigis, S. M. McEntire, R. W. Paschmann, G.	Applied Physics Laboratory Applied Physics Laboratory Max-Planck-Institut für Extraterrestrische Physik, Garching bei München Federal Republic of Germany
Shelley, E. G. Valenzuela, A.	Lockheed Palo Alto Research Laboratory Max-Planck-Institut für Extraterrestrische Physik, Garching bei München Federal Republic of Germany

## B5. Copernicus Guest Investigators and Investigations

- Study of the Nature of Shells in Be Stars**  
G. J. Peters, University of Southern California
- Study of Circumstellar Shells and Stellar Wind Variability in Be Stars and OB Supergiants**  
T. P. Snow, University of Colorado
- Search for Coronal Features or Circumstellar Cloud Around Sirius B**  
M. P. Savedoff, University of Rochester
- Oscillator Strengths for NI and OI**  
D. C. Morton, Anglo-Australian Observatory
- Ultraviolet and Visible-Wavelength Observations of Spectral Variations in the Mass-Losing Be Star 59 Cygni**  
T. P. Snow, University of Colorado, et al
- A Survey of Interstellar Magnesium in the Directions of A and B Stars Within 100 Parsecs**  
R. E. Stencel, Y. Kondo, and E. J. Weiler, GSFC and NASA Headquarters
- Search for Variability in the X-Ray Emission of the BL LAC Object PKS 0548-322**  
C. S. Bowyer and K. O. Mason, University of California, Berkeley
- Spectral Variability of Accreting Degenerate Dwarfs**  
C. S. Bowyer, K. O. Mason, D. Lamb, and G. Branduardi, University of California, Berkeley
- Search for Interstellar Boron**  
Meneguzzi, Centre d'Etudes Nucléaires de Saclay, France
- Observation of Hot Companions of Mira Variables**  
H. M. Johnson, Lockheed Missiles and Space Co.
- A Search for Interstellar SiO in Diffuse Clouds**  
T. P. Snow, University of Colorado
- Interstellar Observations of OB Associations with the Copernicus Satellite**  
J. M. Shull, University of Colorado
- Velocity Structure in H<sub>2</sub> Lines Toward Pi Aquari**  
T. P. Snow, University of Colorado
- Simultaneous In-Eclipse UV Observations of Early-Type Eclipsing Binary Stars**  
D. D. Meisal and C. Mees, State University of Arts and Science, Geneva, New York

B5 continued

Doppler Line Profile Measurement of the Jovian Lyman Alpha Emission  
S. K. Atreya et al, University of Michigan

Search for Weak Interstellar Lines (O IV, NV, BIII)  
D. C. Morton, Anglo-Australian Observatory, Australia

Extension of the D/H Study Toward Hot Stars  
C. Laurent and A. Vidal-Madjar, Centre National de la Recherche Scientifique, France

High Velocity Stellar Winds in HI  
C. Laurent and A. Vidal-Madjar, Centre National de la Recherche Scientifique, France

High Velocity Gas in the Vicinity of Iota Orionis  
C. Laurent and A. Vidal-Madjar, Centre National de la Recherche Scientifique, France

Study of Argon in High Velocity Gas  
C. Laurent and A. Vidal-Madjar, Centre National de la Recherche Scientifique, France

Observations of Rotationally Excited HD and Search for Interstellar HCl toward Zeta Ophiuchi  
M. Jura, University of California, Los Angeles

Observations of Interstellar C<sub>2</sub>  
B. Lutz, Lowell Observatory, W. H. Smith, Washington University, and T. P. Snow, University of Colorado

Atmospheric Density Measurements  
R. L. White, The Charles Stark Draper Lab., Inc.

Search for OVI in 29 CM<sub>4</sub> and Study of Far UV, Red-Shifted Lines in Three Stars  
D. C. Morton, Anglo-Australian Observatory, Australia

Survey of Interstellar CI and CO  
M. A. Jura, University of California, Los Angeles

UV Observations of an Interstellar Cloud with Anomalous Depletions  
P. C. Frisch, University of Chicago

Abundance Patterns in HII Regions  
J. Silk, University of California, Berkeley, and D. York, Princeton University

Depletion of Fluorine in Interstellar Gas  
D. York, Princeton University, and T. P. Snow, University of Colorado

B5 concluded

**Observation of Lyman Alpha from the Algol Binary System**

F. B. Wood and K.-Y. Chen, University of Florida, Gainesville

**A Search for Fe III Shell Lines in the Spectra of the Pole-On Be Stars 31 Peg and Omega CMa**

G. J. Peters, University of Southern California

**Observations of Selected Emission Lines in Beta Lyrae at Various Phases of Its 12.9-Day Period**

M. Plavec, University of California, Los Angeles

**Scanning of Selected Shell Absorption Lines in Phi Persei at Various Phases of Its 126.5-Day Period**

M. Plavec, University of California, Los Angeles

**Search for Interstellar H<sub>2</sub>O**

T. P. Snow, University of Colorado, and W. H. Smith, Washington University

**An UV Survey of Be Stars (with Ground-Based Observations)**

J. M. Marlborough, University of Western Ontario; A. Slettebak, Ohio Wesleyan University; G. Spear, California State College, Sonoma; G. Peters, University of Southern California; and T. P. Snow, University of Colorado

**An Attempt to Detect Forbidden Lines of CIII from Interstellar Gas**

L. M. Hobbs, University of Chicago and D. York, Princeton University

**Study of Refractory Element Abundances in High Velocity Interstellar Gas**

L. M. Hobbs, University of Chicago and D. York, Princeton University

**A Search for Variability in the UV Spectrum of Pi Aquari**

G. J. Peters, University of Southern California

**The Profile and Period of the 4.8-Hour X-Ray Modulation of Cyg. X-3**

C. S. Bowyer and K. O. Mason, University of California, Berkeley

**Long-Term X-Ray Observations of Systems with Unusual Op.**

C. S. Bowyer and P. A. Charles, University of California, Berkeley

B6. International Solar Polar Mission (ISPM)  
Theoretical and Interdisciplinary Scientists

<u>Member</u>	<u>Affiliation</u>
A. Barnes	NASA/Ames Research Center
J. C. Brandt	NASA/Goddard Space Flight Center
L. A. Fisk	University of New Hampshire
J. R. Jokipii	University of Arizona
J. Lemaire	Institute d'Aeronomie Spatiale de Belgique, Belgium
G. Noci	Arcetri Observatory, Italy
C. P. Sonett	University of Arizona

B7. LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Spherical Harmonic Representation of the Main Geomagnetic Field for World Charting and Investigation of Some Fundamental Problems of Physics and Geophysics	Produce an accurate model of the main geomagnetic field, together with reliable estimates of the accuracy of coefficients	David R. Barraclough Institute of Geological Sciences/United Kingdom
Investigation of Antarctic Crust and Upper Mantle Using Magsat and Other Geophysical Data	Using Magsat data, devise a general framework for the structure of Antarctica into which more specific and local measurements can be integrated	Charles R. Bentley University of Wisconsin
Geomagnetic Field Forecasting and Fluid Dynamics of the Core	To adjust the Gauss coefficients of the Magsat main field model to satisfy dynamic constraints; to use Magsat data to test the ability to forecast the structure of the internal geomagnetic field	Edward R. Benton University of Colorado
Magsat for Geomagnetic Studies in the Indian Region	Prepare a regional geomagnetic reference field and magnetic anomaly maps over the Indian and neighboring regions; to gain a clearer understanding of secondary effect features and the variability of the dawn/dusk field; to study in detail the equatorial electrojet and transient variations	B. N. Bhargava Indian Institute for Geomagnetism/India
Satellite Magnetic and Gravity Investigation of the Eastern Indian Ocean	Produce magnetic anomaly maps of the Indian Ocean; quantify the comparison between Magsat data and GEOS 3 gravity data; interpret the magnetic data using ancillary data	Robert F. Brammer The Analytic Sciences Corporation

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Studies of High Latitude Current Systems Using Magsat Vector Data	Understand the physical processes which control high latitude current systems; improve the confidence level in studies of internal field sources	J. Ronald Burrows National Research Council of Canada/ Canada
Use of Magsat Anomaly Data for Crustal Structure and Mineral Resources in the U.S. Midcontinent	To analyze Magsat anomaly data to synthesize a total geologic model and interpret crustal geology in the midcontinent region; to contribute to the interpretation and calculation of the depth of the Curie Isotherm	Robert S. Carmichael University of Iowa
The Reduction, Verification and Interpretation of Magsat Magnetic Data Over Canada	Select quiet-time data; correct Magsat data for disturbance fields and apply the routines; compare Magsat and vector airborne data; combine magnetic anomaly data from Magsat and aircraft; produce regional interpretations relating to Earth structure	Richard L. Coles Energy, Mines and Resources Canada/Canada
Magsat Data, the Regional Magnetic Field, and the Crustal Structure of Australia and Antarctica	Incorporate Magsat data into regional magnetic field charts to improve their accuracy; determine if differences exist in temperature-depth curves for different tectonic areas; study the boundaries between major tectonic blocks, and between continental and oceanic crust; determine Curie point depth and crustal magnetization for Antarctica	James C. Cooley Bureau of Mineral Resources/Australia

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Proposal from Japanese National Team for Magsat Project	Analysis of the regional geomagnetic field around Japan and Japanese Antarctica; study the contributions to magnetic variations by electric currents and hydromagnetic waves in and above the ionosphere	Naoshi Fukushima Geophysics Research Laboratory/Japan
Crustal Structures Under the Active Volcanic Areas of Central and Eastern Mediterranean	Calculate the depth of the Curie temperature for the Mediterranean area, and relate to areas of volcanic activity; investigate the Italian and Tyrrhenian anomaly	Paolo Gasparini Osservatorio Vesuviano/ Italy
Geomagnetic Field Modeling by Optimal Recursive Filtering	To produce a state vector to predict field values for several years beyond the Magsat model; to obtain optimal estimates of field values throughout the 1900-1980 period	Bruce P. Gibbs Business and Technological Systems, Incorporated
Magnetic Anomaly of Bangui	Improve the explanation of the cause of the Bangui anomaly, using Magsat data, other magnetic data, gravity, seismic, and heat flow data	M. R. Godivier Office de la Recherche Scientifique et Technique Outre-Mer/ France
The Mineralogy of Global Magnetic Anomalies	To interpret Magsat data to locate mafic and ultramafic source rocks and lineament expressions of anomalies that can be correlated with crustal or upper mantle depths; to determine mineral stabilities pertinent to magnetic anomalies to determine the magnetic properties of metamorphic rocks	Stephen E. Haggerty University of Massachusetts

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Identification of the Magnetic Signatures of Lithostratigraphic and Structural Elements in the Canadian Shield Using Magnetic Anomalies and Data from Individual Tracks from Magsat	Confirm and extend the model for the crust/mantle magnetization	D. H. Hall University of Manitoba/ Canada
Investigations of Medium Wavelength Magnetic Anomalies in the Eastern Pacific Using Magsat Data	To determine the relationship of magnetic anomalies with surface geological features	Christopher G.A. Harrison University of Miami
An Investigation of Magsat and Complementary Data Emphasizing Precambrian Shields and Adjacent Areas of West Africa and South America	To determine the Magsat magnetic signatures of various tectonic provinces; to determine the geological associations of these signatures; to synthesize Magsat and other data with mineral resources data globally	David A. Hastings Technicolor Graphic Services, Incorporated
Electromagnetic Deep-Probing (100-1000 km) of the Earth's Interior from Artificial Satellites: Constraints on the Regional Emplacement of Crustal Resources	To evaluate the applicability of electromagnetic deep-sounding experiments using natural sources in the magnetosphere	John F. Hermance Brown University

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Application of Mag- sat to Lithospheric Modeling in South America: Part I-- Processing and Inter- pretation of Magnetic and Gravity Anomaly Data	Magnetic anomalies will be used to develop litho- spheric models to deter- mine the properties of principal tectonic features; magnetic anomalies of South America will be correlated with those of adjacent continental areas to at- tempt to reconstruct Gondwanaland (see Keller, p. B-22)	William J. Hinze Purdue University
An Investigation of the Crustal Proper- ties of Australia and Surrounding Regions Derived from Interpretation of Magsat Anomaly Field Data	Produce a map of surface magnetization to under- stand the evolution of the crust and to aid in mineral exploration	B. David Johnson Macquarie University/ Australia
Comparison of Storm- time Changes of Geo- magnetic Field at Ground and at Magsat Altitudes	To differentiate be- tween ionospheric and magnetospheric origin for fluctuations in individual storms	R. P. Kane Instituto de Pesquisas Espaciais/Brazil
Analysis of Magsat and Surface Data of the Indian Region	To develop a field mo- del through numerical integration and the non-linear least squares technique; to study geomagnetic anomaly data in con- junction with allied geophysical data for assessment of natural resource and tectonic features	K. L. Khosla Surveyor General/India

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Application of Mag-sat to Lithospheric Modeling in South America Part II-- Synthesis of Geologic and Seismic Data for Development of Integrated Crustal Models	To provide models of the seismic velocity structure of the lithosphere (see Hinze, p. B-21)	G. R. Keller University of Texas at El Paso
Investigation of the Effects of External Current Systems on the Magsat Data Utilizing Grid Cell Modeling Techniques	Apply a modeling procedure to the vector Magsat data in order to separate the terrestrial component from that due to extraterrestrial sources	David M. Klumpar University of Texas at Dallas
Analysis of Intermediate-Wavelength Magnetic Anomalies Over the Oceans in Magsat and Sea Surface Data	To determine the distribution of intermediate wavelength magnetic anomalies of lithospheric origin in the oceans; the extent to which Magsat describes the distribution, and to determine the cause of these anomalies	John L. LaBrecque Lamont-Doherty Geological Observatory
Magsat Investigations Consortium	Reduce Magsat vector data for a global analytic field model and constant altitude field maps; compare Magsat data to regional studies; study features of the core field; correlate globally and regionally Magsat and gravimetric data	Jean-Louis le Mouel Institut de Physique du Globe de Paris/France

B7 continued

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Magsat Anomaly Field Inversion and Interpretation for the U.S.	To construct a regional crustal temperature/heat flow model based on a developed magnetization model, heat flow/production data, and spectral estimates of the Curie depth	Michael A. Mayhew Business and Technological Systems, Incorporated
Equivalent Source Modeling of the Main Field Using Magsat Data	To model the core field; compute equivalent spherical harmonic coefficients for comparison with other field models; to examine the spectral content of the core field	Michael A. Mayhew Business and Technological Systems, Incorporated
Structure, Composition, and Thermal State of the Crust in Brazil	Construct preliminary crustal models in the Brazilian territory; point out possible variations in crustal structure among different geological provinces	Igor I. Gil Pacca Universidade de Sao Paulo/Brazil
A Proposal for the Investigation of Magsat and Triad Magnetometer Data to Provide Corrective Information on High-Latitude External Fields	Identify and evaluate high-latitude external fields from the comparison of data acquired by the Magsat and Triad spacecraft which can be used to improve geomagnetic field models	Thomas A. Potemra Johns Hopkins University
Improved Definition of Crustal Magnetic Anomalies in Magsat Data	Develop an improved method for the identification of magnetic anomalies of crustal origin in satellite data by better defining and removing the most persistent external field effects	Robert D. Regan Phoenix Corporation

B7 concluded

LIST OF NASA-SELECTED MAGSAT INVESTIGATORS

<u>Investigation Title</u>	<u>Objectives</u>	<u>Investigator and Affiliation</u>
Study of Enhanced Errors and of the Secular Magnetic Variation Using Magsat Models and Those Derived in POGO Surveys	To estimate the secular variation over the period 1965-80 by removing mathematical instability based upon scalar field intensity alone	David P. Stern NASA/Goddard Space Flight Center
Proposal to Analyze the Magnetic Anomaly Maps from Magsat Over Portions of the Canadian and Other Shields	Examination of the expected difference between the Grenville and Superior provinces	David W. Strangway University of Toronto/ Canada
Compatibility Study of the Magsat Data and Aeromagnetic Data in the Eastern Piedmont of the U.S.	Evaluate the compatibility between the Magsat and aeromagnetic data in the Eastern North Carolina Piedmont	Ihn Jae Won North Carolina State University

## APPENDIX C - DEFINITIONS

Certain words and phrases are used in this report in a precise and specific sense. These terms are defined here to clarify the intended meaning.

Active -	A spacecraft/experiment pertinent to this report that has been launched and was reported to NSSDC to have either a "normal" or "partial" status.
Apoapsis -	The distance from the center or the altitude from the surface of the reference body to the furthest orbit point. Distance is used in astronomical units (AU) for heliocentric orbits and altitude is used in kilometers (km) for all other orbits.
Approved Mission -	A spacecraft mission has been approved and funding is or will be available for it.
Brief Description -	A concise summary of the spacecraft mission, specifically outlining overall mission objectives and the scientific studies being performed. Also, a concise summary of experiment purposes and instrument characteristics, emphasizing those relevant to scientific use of the resulting data.
Canceled Mission -	A mission was canceled and no funds are expected to become available to carry it out.
Failed Mission -	A spacecraft failed to achieve a suitable orbit, or the experiments failed to function after achieving orbit.
Inclination -	The angle (in degrees) between the satellite orbital plane and the equatorial plane of the primary gravitational body. For satellites with heliocentric orbits, the ecliptic plane is used in lieu of the equatorial plane.
Inoperable -	A spacecraft/experiment can no longer produce useful scientific data due to: malfunction or failure of the spacecraft/experiment systems or critical parts thereof; completion of the spacecraft trajectory in which useful measurements could be taken; or discontinuation of network support (tracking, command, and telemetry).
Normal -	Spacecraft/experiment systems are capable of working so that the data would be suitable for all planned scientific studies for the spacecraft/experiments when they are turned on and the data are recorded.

NSSDC ID Code -	An identification code used in the NSSDC information system. In this system, each successfully launched spacecraft/experiment is assigned a code based on the launch sequence of the spacecraft. Subsequent to 1962, this code (e.g., 72-012A for the spacecraft Pioneer 10) corresponds to the COSPAR international designation. The experiment codes are based on the spacecraft code. For example, the experiments carried aboard the spacecraft 73-019A (Pioneer 11) are numbered 73-019A-01, 73-019A-02, etc. Each prelaunch spacecraft and experiment is also assigned an NSSDC ID code based on the name of the spacecraft. For example, the approved NASA launch, Solar Mesosphere Explorer, would be coded SME. The experiments to be carried aboard this spacecraft would be coded SME -01, SME -02, etc. Once a spacecraft is launched, its prelaunch designation is changed to a postlaunch one; e.g., Pioneer-G, which was launched April 6, 1973, was given the NSSDC ID code of 73-019A, corresponding to the launch spacecraft common name, Pioneer 11.
Orbit Type -	A word or phrase indicating the most important phase of the trajectory of a given spacecraft mission. The orbit type may be geocentric, geocentric commensurate, selenocentric, heliocentric, Hermocentric (Mercury), Cythereanocentric (Venus), Aero-centric (Mars), Zenocentric (Jupiter), Chronocentric (Saturn), lunar lander, Venus lander, Mars lander, Jupiter lander, lunar flyby, Venus flyby, Mars flyby, Mercury flyby, Jupiter flyby, Venus probe, or Jupiter probe.
Partial -	Spacecraft/experiment systems are working, but not all are working as well as the design required. If the spacecraft/experiments were turned on and the data recorded, the data would be suitable for only a portion of the planned scientific studies.
Periapsis -	The distance from the center or the altitude from the surface of the reference body to the nearest orbit point. Distance is used in astronomical units (AU) for heliocentric orbits and altitude is used in kilometers (km) for all other orbits.
Planned-	A spacecraft mission was last reported to NSSDC as either "approved" or "proposed." Also indicates an experiment is expected to fly on a planned spacecraft mission.
Proposed Mission -	Spacecraft design and experiments have been selected but funding has not been approved.
Standard -	Data that can be processed and made available to the experimenters are being acquired at the rate or percentage of coverage required to accomplish the planned studies.

Substandard -	Data that can be processed and made available to the experimenters are <u>not</u> being acquired at the rate or percentage of coverage required to continue all planned studies.
Unknown -	Information is either unknown or unavailable at NSSDC.
Zero -	Applied to data acquisition rates, indicates a spacecraft/experiment has been turned off except for state of health measurements and is in a standby condition, capable of being returned to its previous status; or, a spacecraft/experiment has failed and is incapable of returning additional data.

## APPENDIX D - ABBREVIATIONS AND ACRONYMS

A	angstrom
ABMA	Army Ballistic Missile Agency
AC	alternating current
ACAD	academy
ACIC	Aeronautical Chart and Information Center (now Defense Mapping Agency Aerospace Center)
ACS	attitude control system
AD	Dual Air Density Explorer (satellite, NASA)
A/D	analog to digital
AE	Atmosphere Explorer (satellite, NASA)
AEC	Atomic Energy Commission
AEM	Atmospheric Explorer Mission
AEROPROPUL	aeropropulsion
AEROSAT	Aeronautical Satellite (NASA-ESA)
AEROSP	aerospace
AFB	Air Force Base
AFCRL	Air Force Cambridge Research Laboratories (now US Air Force Geophysics Laboratory)
AFGL	Air Force Geophysics Laboratory
AFO	Announcements of Flight Opportunities
AFSC	Air Force Systems Command
AGC	automatic gain control
AGCY	agency
AH	amp hours
AIMP	Anchored Interplanetary Monitoring Platform (satellite, NASA)
AK	Alaska
AL	Alabama
ALOSYN	Alouette topside sounder synoptic (data)
ALPO	Apollo Lunar Polar Orbiter (satellite, NASA); Association of Lunar and Planetary Observers
ALS	advanced limb scanner
ALSEP	Apollo Lunar Surface Experiments Package (NASA)
ALT	altitude
AM	amplitude modulation
A.M.	ante meridien
AMP	ampere
AMPS	Atmosphere, Magnetosphere, and Plasmas in Space (satellite, NASA)
AMS	Army Map Service (now Defense Mapping Agency Topographic Center)
AMSAT	Radio Amateur Satellite Corporation
AMU	atomic mass unit; atomic mass unit; astronaut maneuvering unit
ANIK	Canadian Telecommunications Satellite; also referred to as TELESAT
ANNA	Army, Navy, NASA, Air Force (geodetic satellite)
ANS	Astronomical Netherlands Satellite (The Netherlands-NASA)
AOGO	Advanced Orbiting Solar Observatory
AP	magnetic activity index Ap
APL	Applied Physics Laboratory of Johns Hopkins University
APPL	application
APT	automatic picture transmission
A/R	acquisition/reference

AR	Arkansas
ARC	Ames Research Center (NASA)
ARC-MIN	arc-minute
ARC-S	arc-second
ARDC	Air Research and Development Command (now AFSC)
ARPA	Advanced Research Projects Agency
ARSP	Aerospace Research Support Program (USAF)
AS+E	American Science & Engineering, Inc.
ASOS	antimony-sulfide oxy-sulfide
ASTP	Apollo-Soyuz Test Project (USSR-NASA)
ASTROPHYS	astrophysics
AT	atomic
ATCOS	Atmospheric Composition Satellite (NASA)
ATDA	Alternate Target Docking Adapter
ATFE	advanced thermal control flight experiment
ATM	Apollo Telescope Mount; atmosphere
ATMOS	Atmospheric Trace Molecules Observed by Spectroscopy
ATS	Applications Technology Satellite (NASA)
AT&T	American Telephone & Telegraph Corp.
ATU	Adaptive Tracker Unit
AU	astronomical unit
AUST	Australia
AVCS	advanced vidicon camera system
AVG	average
AVHRR	advanced very high resolution radiometer
AWRE	Atomic Weapons Research Establishment (Australia)
AXIS	atmospheric X-ray imaging spectrometer
AZ	Arizona
BAF	barium fluoride
BCD	binary coded decimal
BCG	ballistocardiogram
BE	Beacon Explorer (satellite, NASA); beryllium
BEV	billion electron volts
BIC	barium iodide cloud
BIMS	Bennett ion mass spectrometer
BIOS	Biological Satellite (NASA)
BPI	bits per inch
BPS	bits per second
BSU	basic sounding unit
BTL	Bell Telephone Laboratories
BUV	backscatter ultraviolet
BV	billion volts
B/W	black and white
BWF	Bundesminister fur Wissenschaftliche Forschung (Fed Rep of Germany)
CA	California
CAF	calcium fluoride
CAL	calorie

CAL TECH California Institute of Technology  
CALSPHERE calibration sphere  
CAMEO Chemically Active Materials Ejected In Orbit (satellite, NASA)  
CAN Canada  
CAS Cooperative Applications Satellite (France-NASA)  
CAV composite analog video  
CBE controlled beam emissions  
CCD charged-coupled device  
CCE Charge Composition Explorer (satellite, NASA)  
CCP charged and current probes  
CD cadmium; crystal detector  
CDA command and data acquisition (station)  
CDC Control Data Corporation  
C+DH control and data handling  
CDHP Command and Data Handling Package  
CDS cadmium sulfide  
CEM channel electron multipliers  
CENS Centre d'Etudes Nucleaires de Saclay (France)  
CEP Cylindrical Electrostatic Probe  
CFA crossed electric and magnetic field analyzer  
CHASE coronal helium abundance Spacelab experiment  
CHEM charge and energy mass spectrometer; chemical  
CI co-investigator  
CID cathode imaging detector  
CM command module; centimeter  
CMD command  
CMS composition measurement system  
CN cellulose nitrate  
CNES Centre National d'Etudes Spatiales (France)  
CNET Centre National d'Etudes des Telecommunications (France)  
CNRS Centre National de la Recherche Scientifique (France)  
CO Colorado  
COBE Cosmic Background Explorer (satellite, NASA)  
COMM commission  
COMSAT Communications Satellite Corporation  
CONIE Comision Nacional de Investigacion del Espacio (Spain)  
CORSA Cosmic-Ray Satellite (Japan)  
COS Cosmic-Ray Satellite (ESA); cosmic  
COSPAR Committee on Space Research  
COUNC council  
CO2 carbon dioxide  
CPA comprehensive particle analysis  
CPS cycles per second  
CPT charged-particle telescope  
CPU central processing unit  
CRC Communications Research Centre (Canada)  
CRIE cosmic-ray isotope experiment  
CRPL Central Radio Propagation Laboratories (later ITSA; formerly  
part of ESSA; now NOAA/ERL)  
CRREL Cold Region Research & Engineering Laboratories  
CRS Commission for Space Research (Italy)  
CRT cathode ray tube

CSI	cesium iodide
CSM	command service module
CSTE	cesium telluride
CT	Connecticut
CTR	center
CTS	Canadian Telecommunications Satellite
CULER	cryogenic upper-atmosphere limb emission radiometer
CVF	circular variable filter
CXX	white light coronograph/X-ray XUV telescope
CZCS	coastal zone ocean color scanner
D	day
DAC	data acquisition camera
DADE	Dual Air Density Explorer (satellite, NASA)
DAN	Danish
DAPP	Defense Acquisition and Processing Program (DOD)
DASA	Defense Atomic Support Agency
DATS	Despun Antenna Test Satellite (DOD)
DB	decibel
DC	direct current; District of Columbia
DCLS	data collection and location system
DCP	data collection platform
DCS	direct couple system; data collection system
DDM	drop dynamics module
DE	Dynamics Explorer (satellite, NASA); Delaware
DEF	defense
DEG	degree
DENPA	Density Phenomena (satellite, Japan)
DEV	development
DFI	development flight instrumentation
DFVLR	Deutsche Forschungs-und Versuchsanstalt fur Luft-und Raumfahrt; (Research Laboratory for Aeronautics and Astronautics, Fed Rep of Germany)
DIAL/MIKA	Diament Allemande/Mini Kapsel (satellite, Fed Rep of Germany-France)
DIAL/WIKA	Diament Allemande/Wissenschaftliche Kapsel (satellite, Fed Rep of Germany)
DIAM	diameter
DIAPO	Diapason (satellite, France)
DIRBE	diffuse infrared background experiment
DIT	Drexel Institute of Technology (now Drexel University)
DMA	Defense Mapping Agency
DMAAC	Defense Mapping Agency Aerospace Center
DMATC	Defense Mapping Agency Topographic Center
DME	Direct Measurements Explorer (satellite, NASA)
DMR	differential microwave radiometer
DMSP	Defense Military Satellite Program (DOD)
DMU	IUE data multiplex unit
DOD	Department of Defense
DODGE	Department of Defense Gravity Experiment (satellite, DOD)

DPL	VLF Doppler Propagation
DPU	data processing unit
DRID	direct readout image dissector (camera system)
DIRIR	direct readout infrared radiometer
DRTE	Defense Research Telecommunications Establishment (now CRC)
DSAP	Defense System Applications Program (DOD)
DSCS	Defense Satellite Communications System (DOD)
DSIR	Department of Science and Industrial Research (England)
DSN	Deep Space Network
DUS	data utilization stations
DV	digital video
DYN	dynamic
E	energy; east
EASEP	Early Apollo Scientific Experiment Package
EBS	electron beam system
ECG	electrocardiograph
ECS	Experimental Communications Satellite (NASA)
EDS	Environmental Data Service (NOAA)
EEG	electroencephalogram
EFI	electric field instrument
EGO	Eccentric (Orbiting) Geophysical Observatory (satellite, NASA)
EGRS	Engineers Satellite (DOD)
EICS	energetic ion composition spectrometer
EIRP	effective isotropic radiative power
EL	electric (data camera carried on Apollo)
ELDO	European Launch Development Organization (ESA)
ELEC	electric
ELECTR	electronics
ELF	extremely low frequency
ELMS	Earth Limb Measurement Satellite (NASA-USAF)
EME	environmental measurement experiment
EMG	electromyogram
EMR	Electromechanical Research (Company, England)
ENVIRON	environment; environmental
EOF	end of file
EOG	electro-oculogram
EOGO	Eccentric Orbiting Geophysical Observatory (satellite, NASA)
EOS	Earth Observation Satellite (NASA)
EPE	Energetic Particle Explorer (satellite, NASA)
E/Q	energy per unit charge
ERB	Earth radiation budget (experiment)
ERBI	Earth radiation budget instrument
ERBS	Earth Radiation Budget Satellite (NASA)
ERBSS	Earth Radiation Budget Satellite system
ERDC	Earth Resources Data Center
ERGS	Earth Geodetic Satellite (USAF)
ERL	Environmental Research Laboratory (NOAA)
EROS	Earth Resources Observation Service
ERS	Environmental Research Satellite (USAF)

ERT extended range telescope  
ERTS Earth Resources Technology Satellite (NASA)  
ESA European Space Agency; electrostatic analyzer  
ESA-GEOS Geostationary Earth-Orbiting Satellite (ESA)  
ESM equipment support module  
ESMR electrically scanning microwave radiometer  
ESOC European Space Operations Centre (ESA)  
ESP energy spectrum of particles  
ESRO European Space Research Organization (now ESA)  
ESSA Environmental Science Services Administration (now NOAA)  
ESTABL establishment  
ESTEC European Space Technology Center (ESA)  
ETR Eastern Test Range (also referred to as Cape Canaveral)  
ETS Engineering Test Satellite  
EU europium  
EUV extreme ultraviolet  
EUVE Extreme Ultraviolet Explorer (satellite, NASA)  
EUVS extreme ultraviolet spectrophotometer  
EV electron volt  
EVA extravehicular activity  
EVM Earth-viewing (equipment) module  
EXOS Exospheric Satellite (Japan)  
EXOSAT European X-ray Observation Satellite (ESA)  
EXTRATERR extraterrestrial

FARO Flare-Activated Radiobiological Observatory (satellite, DOD)  
FAUST far ultraviolet space telescope  
FE iron  
FES fluid experiment systems  
FGS fine guide system  
FIRAS far infrared absolute spectrophotometer  
FL Florida  
FLT-SAT Fleet Satellite (USN)  
FM frequency modulation  
FMDM flex multiplexer/demultiplexer  
FMRT final meteorological radiation tape  
FOC faint object camera  
FOF2 frequency of F2  
FOS faint object spectrograph  
FOUND foundation  
FOV field of view  
FPEG fast pulse electron gun  
FPI Fabry-Perot interferometer  
FPR flat plate radiometer  
FR French Research (satellite, France)  
FRC Flight Research Center (NASA)  
FRG Federal Republic of Germany  
FS frequency scatterometer  
FSC FLTSATCOM (satellite, USN-USAF)  
FSK frequency shift key  
FWHM full width at half maximum  
FWS filter wedge spectrometer

G	Earth gravity; geometry factor; gram
GA	Georgia
GAC	global area coverage
GARP	Global Atmospheric Research Program
GCA	Geophysics Corporation of America
GE	General Electric (Company)
.GE.	greater than or equal to
GEMS	Geostationary European Meteorological Satellite (ESA)
GEOPHYS	geophysical
GEOS	Geodetic Earth-Orbiting Satellite (NASA); Geostationary Earth-Orbiting Satellite (ESA)
GES FUR WELTRAUM- FORSCH	Gesellschaft fur Weltraumforschung (Center for Space Research, Fed Rep of Germany)
G.E.T.	ground elapsed time
GEV	giga electron volts ( $10^9$ ev)
GEX	gas exchange
GGSE	gravity gradient stabilization experiment
GHZ	gigahertz
GISS	Goddard Institute for Space Studies (NASA)
GLIMPSE	global limb photometric scanning experiment
GM	Geiger-Mueller
GMS	Geostationary Meteorological Satellite (Japan)
GMT	Greenwich mean time
GOES	Geosynchronous Operational Environmental Satellite (NASA-NOAA; also called SMS)
GP	Gravitational Redshift Space Probe (NASA)
GPS	global positioning system
GRARR	Goddard Range and Range Rate
GRAVR	Gravitational Redshift Space Probe (NASA)
GRE	ground reconstruction equipment; ground reconstruction electronics
GREB	Galactic Radiation Experiment Background (satellite, USN)
GRI	Groupe de Recherche Ionospherique (France)
GROC	Netherlands Committee for Geophysics and Space Research
GRS	German Research Satellite (NASA-Fed Rep of Germany)
GSD	Grid Sphere Drag (satellite, DOD)
GSE	geocentric solar ecliptic (coordinate system); ground support equipment
GSFC	Goddard Space Flight Center (NASA)
GSM	geocentric solar magnetospheric (coordinate system)
.GT.	greater than
GUGMS	Glavnoye Upravleniye Gidrometeorologicheskoi Sluzhby (Main Administration of the Hydrometeorological Service, USSR)
GV	gigavolt
GVHRR	geosynchronous very high resolution radiometer
H	hour; hydrogen
HAC	half-angle colimator
HALOE	halogen occultation experiment
HAO	High Altitude Observatory

HAPI	high-altitude plasma instrument
HCMM	Heat Capacity Map Mission (satellite, NASA)
HCMR	heat capacity mapping radiometer
HCO	Harvard College Observatory
HDRSS	high data rate storage system
HE	helium
HEAO	High-Energy Astrophysical Observatory (satellite, NASA)
HEOS	High-Eccentricity Earth-Orbiting Satellite (ESA)
HEP	high-energy protons
HEPS	high-energy particle spectrometer
HEPAT	high-energy proton alpha telescope
HET	health, education, telecommunications; high-energy telescope
HETS	high-energy telescope system
HEW	US Dept. of Health, Education and Welfare (now US Dept. of Education)
HF	high frequency
HFE	heat-flow experiment; heat-flow electronics
HG	mercury
HGI2	mercuric iodide
HI	Hawaii
HRDI	high-resolution Doppler imager
H2O	water
HOLE	high ionospheric depletion region
HR	high resolution
HRDI	high-resolution Doppler image
HRIR	high-resolution infrared radiometer
HRIRS	high-resolution infrared radiometer sounder
HRPT	high-resolution picture transmission
HRS	high-resolution spectrograph
HRTS	high-resolution telescope and spectrograph
H. S.	high school
HSP	high-speed photometer
HYDROMET	hydrometeorological
Hz	hertz (cycles per second)
HZE	high-energy particle

IA	instrument assembly; Iowa
IAP	Institute of Atmospheric Physics (USSR)
IBM	International Business Machines (Corporation)
ICBM	intercontinental ballistic missile
ICE	ion convection electrodynamics
ICEX	ice and climate experiment
ICSU	International Council of Scientific Unions
ID	identification; Idaho
IDC	image dissector camera
IDCS	image dissector camera system
IDCSP	Initial (or Interim) Defense Communication Satellite Program (or Project) (DOD)
IDM	ion drift meter
IDSCS	Initial Defense Satellite Communication system (DOD)
IDT	instrument definition team

IE Ionospheric Explorer (satellite, NASA-NBS)  
IEAS ice evaluation altimeter system  
IECM induced environment contamination monitor  
IEF impedance & electric field  
IFOV instrument field of view  
IGRF International Geomagnetic Reference Field  
IGY International Geophysical Year  
IKI Institute for Space Research (USSR)  
IL Illinois  
IME International Magnetospheric Explorer (satellite, NASA-ESA)  
IMP Interplanetary Monitoring Platform (satellite, NASA)  
IMS International Magnetospheric Study  
IN Indiana  
IN. inch  
INDASAT Indian Scientific Satellite (ISRO-USSR)  
INOP inoperable  
INSAT Indian National Satellite (ISRO-USSR)  
INSS indium/antimony  
INST institute  
INTA Instituto Nacional de Tecnica Aeroespacial (Spain); the National Institute of Aerospace Science satellite (INTA, Spain)  
INTASAT International Telecommunications Satellite (NASA-COMSAT)  
ION COMP ionospheric composition  
IPA Institute for Physics of the Atmosphere (SAS)  
IPP imaging photopolarimeter  
IPS instrument pointing system  
IGSY International Quiet Sun Year  
IR infrared  
IRAS Infrared Astronomy Satellite (The Netherlands-NASA-UK)  
IRBM intermediate range ballistic missile  
IRIG Inter-Range Instrumentation Group  
IRIS infrared-interferometer spectrometer; International Investigation Radiation Satellite (NASA-ESA)  
IRLS interrogation, recording, and location system  
IRM Ion Release Module (satellite, NASA)  
IRR infrared radiometry  
IRTM infrared thermal mapping  
IRTRN infrared transmission  
ISAMS improved stratospheric & mesospheric sounder  
ISAS Institute of Space & Aeronautical Science (Japan)  
ISEE International Sun-Earth Explorer (satellite, NASA-ESA)  
ISIS International Satellite for Ionospheric Studies (NASA-Canada)  
ISPM International Solar Polar Mission (ESA)  
ISRO Indian Space Research Organization  
ISS Ionospheric Sounding Satellite (Japan)  
ITCZ intertropical convergence zone  
ITE intersite transportation equipment  
ITOS Improved TIROS Operational Satellite (NOAA)  
ITPR infrared temperature profile radiometer  
ITR incremental tape recorder

ITSA	Institute for Telecommunication of Sciences and Aeronomy (formerly a subdivision of ESSA; now NOAA-ERL)
IU	instrument unit
IUE	International Ultraviolet Explorer (satellite, NASA-UK-ESA)
IUS	intermediate upper stage
IWDS	International URSIGRAM and World Days Service
IVI	ion velocity instrument
IZMIRAN	Institute of Terrestrial Magnetism and Aeronomy of the Academy of Sciences (USSR)
JHU	Johns Hopkins University
JPL	Jet Propulsion Laboratory (NASA)
JSC	Johnson Space Center (NASA)
KBS	kilobits per second
KEV	kiloelectron volt
KG	kilogram
KHZ	kilohertz
KM	kilometer
KP	magnetic activity index Kp
KPNO	Kitt Peak National Observatory
KS	Kansas
KSC	Kennedy Space Center (NASA)
KY	Kentucky
LA	Los Angeles, Louisiana
LAB	laboratory
LAC	local area coverage
LACATE	lower atmosphere composition and temperature
LAGEOS	Laser Geodetic Earth-Orbiting Satellite (NASA)
LAMMR	large antenna multifrequency microwave radiometer
LANG	Langmuir probe instrument
LAPI	low-altitude plasma instrument
LARC	Langley Research Center (NASA)
LAS	Large Astronomical Satellite (ESA)
LASL	Los Alamos Scientific Laboratory
LCS	Lincoln Calibration Sphere
LDEF	long-duration exposure facility
.LE.	less than or equal to
LED	light-emitting diode
LEE	low-energy electron
LEM	lunar excursion module
LEMMS	low-energy magnetospheric measurement system
LEPAT	low-energy proton alpha telescope
LEPEDEA	low-energy proton and electron differential energy analyzer
LERC	Lewis Research Center (NASA)
LES	Lincoln Experimental Satellite (DOD)
LET	low-energy telescope

LETS	low-energy telescope system
LF	light fine; low frequency
LI	lithium
LIF	lithium fluoride
LL	Lincoln Laboratory (MIT)
LM	lunar module
LMD	Laboratory of Meteorological Dynamics
LOFTI	Low-Frequency Trans-Ionospheric (satellite, USN-SRL)
LOGACS	Low-G Accelerometer Calibration System (USAF)
LP	Langmuir probe
LPSP	Laboratoire de Physique Stellaire et Planetaire (CNRS)
LR	labeled release; low resolution
LRIR	limb radiance inversion radiometer; low-resolution infrared radiometer
LRL	Lunar Receiving Laboratory (JSC)
LRV	lunar roving vehicle
LS	light smoothed
LST	Large Space Telescope (satellite, NASA; now called Space Telescope)
.LT.	less than
LTV	Ling-Temco-Vought (Company)

M	meter; milli- (prefix)
MA	Mercury Atlas; Massachusetts
MAG	magnetic field
MAG-A	magnetometer A
MAG-B	magnetometer B
MAPS	measurement of air pollution from satellite
MARENTS	Modified Advanced Research Environmental Test Satellite (USAF)
MAS	Ministry of Aviation Supply (UK)
MASC	magnetic attitude spin coil
MATER	material
MAWD	Mars atmosphere water detection
MB	millibar
MC	megacycle
MCC	Mission Control Center
MD	Maryland
ME	Maine
M/E	mass to charge ratio
MED	medicine; medical
MEPA	medium-energy particle analyzer
MEPS	medium-energy particle spectrometer
MESA	miniature electrostatic accelerometer
METEC	Meteoroid Technology (satellite, NASA)
METEOSAT	Meteorological Satellite (ESA)
MEV	million electron volts
MG	magnesium; milligram
MGF	fluxgate magnetometer
MHZ	megahertz
MI	Michigan
MIDAS	Missile Defense Alarm System (USAF)

MIN	minute
MIT	Massachusetts Institute of Technology
MJS	Mariner Jupiter/Saturn (spacecraft, NASA)
MLS	microwave limb sounder
MM	millimeter
MMS	multimission modular spacecraft
MMW	millimeter wave
MN	Minnesota
MO	month; Missouri
MOL	Manned Orbiting Laboratory (satellite, DOD)
M-P	minus-plus
MPD	magneto-plasma dynamic
MPI	Max-Planck-Institute (Fed Rep of Germany)
MR	medium resolution
MRIR	medium-resolution infrared radiometer
MRSE	microwave remote sensing experiment
MS	microsecond; millisecond; Mississippi
MSC	Manned Spacecraft Center (now Johnson Space Center)
MSFC	Marshall Space Flight Center (NASA)
MSIS	mass spectrometer - incoherent scatter (model)
MSN	mission
MSS	Magnetic Storm Satellite (NASA-AFCRL); multispectral scanner
MSSCC	multicolor spin-scan cloudcover camera
MT	Montana
MTS	Meteoroid Technology Satellite (NASA)
MUSE	monitor of ultraviolet solar energy
MV	millivolts ( $10^{-3}$ volts)
MW	milliwatt
N	nucleon; north
NA	not applicable; Nora Alice (satellite, DOD)
NACE	neutral atmosphere composition experiment
NACS	neutral atmosphere composition spectrometer
NADUC	Nimbus/ATS Data Utilization Center
NASA	National Aeronautics and Space Administration (Washington, DC, Headquarters)
NASC	National Aeronautics and Space Council
NASDA	National Space Development Agency (Japan)
NATE	neutral atmosphere temperature experiment
NATL	national
NATO	North Atlantic Treaty Organization
NBS	National Bureau of Standards
NC	North Carolina
NCAR	National Center for Atmospheric Research
NCC	National Climatic Center (NOAA)
ND	North Dakota
NDRE	Norwegian Defense Research Establishment
NE	electron density (concentration); Nebraska
NEMS	Nimbus-E microwave spectrometer; Near-Earth Magnetospheric Satellite (ESA)
NESC	National Environmental Satellite Center (now NESS)

NESS National Environmental Satellite Service (NOAA)  
NGM direct measurement of interstellar gas using HE as tracer  
NGSP National Geodetic Satellite Program  
NH New Hampshire  
NHC National Hurricane Center  
NI ion density (concentration)  
NIH National Institutes of Health  
NIMS near infrared mapping spectrometer  
NJ New Jersey  
NM nanometer; New Mexico  
NMC National Meteorological Center  
NMRT Nimbus meteorological radiation tape  
NNN no national name  
NNSS Navy Navigational Satellite System  
NO. number  
NOAA National Oceanic and Atmospheric Administration (formerly ESSA)  
NOESS National Operational Environmental Satellite Subsystem  
NOMSS National Operational Meteorological Satellite System  
NORAD North American Air Defense Command  
NORM Norwegian  
NOS National Ocean Survey (NOAA)  
NOSS National Oceanic Satellite System  
NOTS Naval Ordnance Test Station  
NPW neutral plasma wave  
NRC National Research Council  
NRL Naval Research Laboratory  
NSA National Security Agency  
NSF National Science Foundation  
NSSDC National Space Science Data Center  
NT nanotesla  
NUCL nuclear  
NWL Naval Weapons Laboratory  
NWP natural plasma waves  
NWRC National Weather Records Center (presently NCC)  
NV Nevada  
NY New York

OA Office of Applications (NASA)  
OAO Orbiting Astronomical Observatory (satellite, NASA)  
OAPS orbit adjust propulsion system  
OAR Office of Aerospace Research (USAF-AFSC)  
OART Office of Advanced Research and Technology (NASA)  
OAST Office of Aeronautics and Space Technology (NASA)  
OBS observatory  
O+C operations and checkout  
OCC OPLE Command Center  
OFO Orbiting Frog Otolith (NASA experimental spacecraft)  
OFT orbital flight test  
OGO Orbiting Geophysical Observatory (satellite, NASA)  
OGPC orbiter general purpose computer  
OH Ohio

OI	other investigator
OIB	orbiter interface box
OK	Oklahoma
OLS	operational linescan system
OMNI	low-resolution omnidirectional radiometer (on Explorer 7)
OMSF	Office of Manned Space Flight (NASA)
ONERA	Office National d'Etudes et de Recherches Aerospatiales
ONR	Office of Naval Research
OOI	orbiter operational instrumentation
OPEP	orbital-plane experiment package
OPF	Orbiter Processing Facility
OPLS	Omega position and location experiment
OP OFF	operational off
OR	Oregon
ORBIS	Orbiting Radio Beacon Ionospheric Satellite (NASA)
ORS	Octahedral Research Satellite (NASA); Orbiting Research Satellite (DOD)
OSCAR	Orbiting Satellite Carrying Amateur Radio
OSO	Orbiting Solar Observatory (satellite, NASA)
OSS	Office of Space Science (NASA); open source spectrometer
OSSA	Office of Space Science and Applications (NASA; now two separate offices)
OSTA	Office of Space and Terrestrial Applications
OT	Operational TIROS (satellite, NASA)
OTDA	Office of Tracking and Data Acquisition (NASA)
OV	Orbiting Vehicle (satellite, USAF)
OVT	organic vapor trap
PA	Pennsylvania
PAC	Packaged Attitude Control (satellite, NASA)
PAET	Planetary Atmosphere Experiment Test
PAGEOS	Passive Geodetic Earth-Orbiting Satellite (NASA)
PAM	pulse amplitude modulation
PC	proportional counter
PCB	power control box
PCM	pulse coded modulation
PD	project director
PDP	plasma diagnostic package; passive dosimeter packet
PE	Planetary Explorer
PEA	planar electrostatic analyzer
PEM	particle environment monitor
PEP	platform electronic package
PES	photoelectron spectrometer
PPM	pulse frequency modulation
PHA	pulse height analyzer
PHASR	Personnel Hazards Associated with Space Radiation (satellite, USAF)
PHYS	physics
PI	principal investigator
PIBS	positive ion beam system
PICNO	picture number

PIMR polar ice mapping radiometer  
PIP Payload Integration Plan  
PIXEL picture element  
PL prelaunch  
PLACE position location and aircraft communication experiment  
PM pulse modulation; photomultiplier  
P.M. post meridien  
PMEL Pacific Marine Environmental Laboratory (NOAA)  
PMP precision mounting platform  
PMR pressure modulation radiometer; Pacific Missile Range  
PMT photomultiplier tube  
P-N positive-negative (junction)  
POCC OFT Payloads Operations Control Center  
POD proton omnidirectional detector  
POGO Polar Orbiting Geophysical Observatory (satellite, NASA)  
PPR photopolarimeter radiometer  
PPS pulses per second  
PR pyrolytic release  
PROT protection  
PS picoseconds; pressure sensor  
PSA pressure sensor A  
PSB pressure sensor B  
PSE passive seismic experiment  
PTL Photographic Technology Laboratory (JSC)  
PWI plasma wave instrument

Q charge  
QOMAC quarter-orbit magnetic attitude control (system)

RA Ranger (spacecraft, NASA)  
RAD radium; radiation  
RADCAT Radar Calibration Target (satellite, ARPA)  
RADDOSE Radiation Dosimeter (satellite, DOD)  
RAE Radio Astronomy Explorer (satellite, NASA); electromagnetic survey & unified radio and plasma wave  
RAHF Research Animal Holding Facility  
RAM random access memory (system)  
RANICON resistor anode image convertor  
RBV return beam vidicon (camera)  
RC resistance capacitor  
RCA Radio Corporation of America  
RCE reaction control equipment  
R&D research and development  
REP republic  
RES research  
REXS Radio Exploration Satellite (Japan)  
RF radio frequency  
RFI radio frequency interference  
RHU radioscope heater units  
RI Rhode Island

RIMS retarding ion mass spectrometer  
RM Radiation Meteoroid (satellite, NASA); Radiometric Measurement (satellite, DOD)  
RMS root mean square; Radiation Meteoroid Satellite (NASA); Radio-metric Measurement Satellite (DOD); remote manipulator system  
RPA retarding potential analyzer  
RPM revolutions per minute  
RPQ retarding potential quadrupole  
RPS revolutions per second  
RRL Radio Research Laboratories (Japan)  
RSRS Radio and Space Research Station (England)  
RTD Research Technology Division (USAF)  
RTG radioisotope thermoelectric generator  
RTTS real-time transmission system

S second; south  
SAA South Atlantic Anomaly  
SACU synchronization and control unit  
SAGE stratospheric aerosol and gas experiment  
SAI spin-scan auroral imager  
SAM stratospheric aerosol measurement  
SAMOS Satellite Mission Observation (satellite, USAF)  
SAMS stratospheric and mesospheric sounder  
SAMSO Space and Missile Systems Organization (USAF)  
SAO Smithsonian Astrophysical Observatory  
SAPPSAC spacecraft attitude precision pointing and slewing adaptive control  
SAR synthetic aperture radar  
SAS Small Astronomy Satellite (NASA); Soviet Academy of Sciences  
SATAR Satellite for Aerospace Research (NASA)  
SATELL satellite  
SATS Satellite Antenna Test System (NASA)  
SBRC Santa Barbara Research Center  
SC project scientist; spark chamber; South Carolina  
S/C spacecraft  
SCAMS scanning microwave spectrometer  
SCAT scattometer  
SCATHA spacecraft charging at high altitudes  
SCEL Signal Corps Engineering Laboratories  
SCH school  
SCI science  
SCMR surface composition mapping radiometer  
SCORE Signal Communication by Orbiting Relay Equipment (satellite, DOD)  
SCR selective chopper radiometer  
SCS selective combined plasma spectrometer  
SD San Diego; South Dakota  
SDPF Sensor Data Processing Facility  
SE Solar Explorer (satellite, NASA)  
SEA spherical electrostatic analyzer  
SEASAT Ocean Dynamic Satellite (NASA)  
SEC secondary electron conduction (vidicon tube)

SECOR	Sequential Collation of Range (satellite, USAF)
SEM	space environment monitor
SEO	Satellite for Earth Observations (Program, India)
SEPAC	space experiments with particle accelerators
SERT	Spinning Satellite for Electric Rocket Test (NASA)
SESP	Space Experiment Support Program
SESPO	Space Environmental Support Project Office
SPA	sweep frequency analyzer
SMS	Soviet Hydrometeorological Service
SIBS	Salk Institute for Biological Studies
SIDS	Space Investigations Documentation System (NASA)
SIG	selenide isotope generator
SIM	scientific instrument module
SIRE	satellite infrared experiment
SIRS	satellite infrared spectrometer; System for Information Retrieval and Storage (NSSDC)
SM	San Marco (satellite, NASA-Italy)
SMC	scanning modulation collimator
SME	Solar Mesosphere Explorer (satellite, NASA)
SMM	Solar Maximum Mission (satellite, NASA)
SMMR	scanning multispectral microwave radiometer
SMS	Synchronous Meteorological Satellite (NASA)
S/N	signal to noise
SNAP	systems for nuclear auxiliary power
SOEP	solar-oriented experiment package
SOLRAD	Solar Radiation (satellite, NASA-DOD)
SPADES	Solar Perturbation and Atmospheric Density Measurement Satellite (DOD)
SPHINX	Space Plasma High Voltage Interactive Experiment (satellite, NASA)
SPIDPO	Shuttle Payload Integration and Development Program Office
SPM	solar proton monitor
SPW	stimulated plasma waves
SQ	square
SR	Solar Radiation (satellite, NASA); scanning radiometer; sounding rocket; steradian
SRATS	Solar Radiation and Thermospheric Structure (satellite, Japan)
SRC	Space Research Council; Science Research Council
SRI	Stanford Research Institute
SRPA	spherical retarding potential analyzer
SRT	supporting research and technology
SSC	Satellite Situation Center
SSCC	spin-scan cloudcover camera
SSD	Space Science Division (JPL)
SSH	spherical sensor H
SSM/T	special sensor microwave/temperature sounder
SSPP	Shuttle Spacelab Payloads Project
SSS	Small Scientific Satellite (NASA)
SST	satellite-to-satellite tracking
SSUS	solid spinning upper stage
ST	Space Telescope (satellite, NASA)
STADAN	Spacecraft Tracking and Data Acquisition Network (now STDN)

STARAD	Starfish Radiation (satellite, NASA)
STD	standard
STDN	Spaceflight Tracking and Data Network (NASA)
STL	Space Technology Laboratories (now TRW Systems Group)
STN	station
STP	Solar Terrestrial Probe (satellite, NASA); Solar Terrestrial Physics; Space Test Program
STRATOS	stratosphere
STS	Space Transportation Systems
STUD	studies
SUI	State University of Iowa (now University of Iowa)
SURCAL	Surveillance Calibration (satellite, DOD)
SUSIM	solar ultraviolet spectral irradiance monitor
SVC	service
SW	southwest
SWE	mass separating solar wind; solar wind experiment
SWRF	Sine Wave Response Filter (program)
SXR	solar X-ray flare and cosmic-ray burst investigation
SYNCOM	Synchronous Communication (satellite, NASA)
SYST	system
TAC	Technology Application Center
TACOMSAT	Tactical Communications Satellite (DOD)
TATS	Test and Training Satellite (NASA)
TATSACOM	Tactical Satellite Communications (program, DOD)
TBD	to be determined
TD	technical director; Thor-Delta (satellite, ESA); launch vehicle (NASA-USAF)
TDP	Tracking Data Processor (program)
T+DR	tracking and data relay
TDRSS	tracking and data relay satellite system
TE	electron temperature; tellurium
TEC	telemetry and command; transearth coast
TECH	technical; technology
TED	total energy detector
TEI	transearth injection
TELEsat <sup>®</sup>	satellite, Canada (also referred to as ANIK)
TEMP	temporal; temperature
TET	telescope and electron telescope
TETR	Test and Training (satellite, NASA)
TEV	tetra electron volts
THIR	temperature/humidity infrared radiometer
THORAD-AQE	Thor Augmented Delta Agena (launch vehicle)
TIMATION	Time Location System (USN)
TIP	Tracking Impact Prediction (satellite, DOD)
TIROS	Television and Infrared Observations Satellite (NASA)
TL	team leader
TLD	thermoluminescence detector
TLI	translunar injection
TM	team member; thematic mapper
TN	Tennessee

TOMS	total ozone mapping system
TOPO	topographic
TOPS	Thermal Noise Optical Optimization Communication System (NASA)
TOS	TIROS Operational Satellite (or System) (NASA)
TOVS	TIROS operational vertical sounder
TPS	thick plastic stack
TRAAC	Transit Research and Attitude Control (satellite, USN)
TRANET	Doppler Tracking Network (USN)
TRANSP	transportation
TRS	Tetrahedral Research Satellite (USAF)
TRUST	television relay using small terminals
TRW	Thompson, Ramo, Wooldridge (Inc.)
TS	thermal smoothed
TT	triggering telescope
TTS	Test and Training Satellite (NASA) (also called TATS, TETR)
TWERLE	tropical wind energy conversion and reference level experiment
TX	Texas
U	university; atomic mass unit
UA	unified abstract
UARS	Upper Atmosphere Research Satellite(s)
UCLA	University of California at Los Angeles
UHF	ultrahigh frequency
UK	United Kingdom
UKSRC	United Kingdom Space Research Council
ULEWAT	ultralow-energy wide-angle telescope
ULEZEQ	ultralow-energy Z, E, Q
US	United States
USA	United States Army; United States of America
USAF	United States Air Force
USB	unified s-band; upper side band
USGS	United States Geological Survey
USN	United States Navy
USSR	Union of Soviet Socialist Republics
UT	universal time; Utah
UV	ultraviolet
UVNO	ultraviolet nitric-oxide experiment
UVS	ultraviolet spectrometer
V	volt
VA	Virginia
VAE	visible airglow experiment
VAR	variation
VAS	VISSR atmospheric sounder
VCGS	vapor crystal growth system
VCO	voltage controlled oscillator
VDC	volts DC
VEFI	vector electric field instrument
VHF	very high frequency

VHRR	very high resolution radiometer
VIS	visual imaging spectrometer
VISSR	visible infrared spin-scan radiometer
VLF	very low frequency
VT	Vermont
VTPR	vertical temperature profile radiometer
W	watt; west
WA	Washington
WATS	wind and temperature spectrometer
WBM	wide-band module
WBVTR	wide-band video tape recorder
WDC	World Data Center
WDC-A-R&S	World Data Center A for Rockets and Satellites
WEFAX	weather facsimile
WFC	Wallops Flight Center (NASA); wave form channel
WGSPR	Working Group for Space Physics Research
WI	Wisconsin
WMO	World Meteorological Organization
WPM	words per minute
WRESAT	Weapons Research Establishment Satellite (Australia)
WS	Wallops Station (NASA; now Wallops Flight Center)
WSIR	wide swath imaging radar
WSMR	White Sands Missile Range
WTR	Western Test Range (also referred to as Vandenberg AFB)
WV	West Virginia
WWW	World Weather Watch
WY	Wyoming
XRFS	X-ray fluorescence spectrometer
XUV	extreme ultraviolet
YR	year
Z	atomic number
ZLE	zodiacal light/background starlight investigation